# Electrical Review

WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT

VOL. 74.—No. 23. CHICAGO, SATURDAY, JUNE 7, 1919. PAGE 931.

A Fleet of American Railway Express Company's Electric Trucks.

# Electric Trucks and Transportation

## Transportation an Engineering Problem—Advantages of the Electric Truck and Comparisons with Other Vehicles —Operating Data of American Railway Express Company


By E. E. LASCHUM

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IN introducing the subject of this paper it is pertinent to observe that the American Railway Express Co., made up of the several national express companies, is the largest organization of its kind in the world. The business of this company is transportation, not as an incidental phase of its business, but as its sole function. Obviously, each and every phase of transportation must necessarily be subjected to minute scrutiny, component elements coordinated and systematized, and the most efficient, economic and dependable transportation equipment selected for the various classes of work involved—and operated with great care. Transportation, with an express organization, must be reduced to a science. Hit or miss, or the sentimental selection of equipment, and its slip-shod operation, can have no part in an express company's transportation program—that is, if its business is to be successful.

It too often happens that the merchant or professional man is so busy in his particular line of effort that he overlooks many important factors connected with big business which are necessary for successful management. One of the important factors connected with most business institutions is the haulage or trucking proposition, and if we could bring to light some of the underlying principles of motor trucking, if we could have them thoroughly understood and recognized, we would do much to solve one of the important factors with which the general manager is confronted daily.

The most important of all motor trucking questions to my mind is the selection of proper motor vehicle equipment. Under no circumstances should this important duty be assigned to the unskilled, in fact every trucking proposition of importance should be carefully analyzed by unbiased, qualified engineers and their specifications should be the rule and guide. In other words, a firm contemplating the purchase of motor vehicle equipment should not merely think in motor vehicle terms when buying or being sold motor vehicle equipment, but it should have an all embracing analysis made of its trucking requirements by competent transportation engineers, thereby giving consideration to all factors necessary to the selection of proper equipment.

After the equipment has been intelligently and properly selected, careful attention must be paid to its proper operation, especially with regard to routes, drivers, helpers, loading and unloading facilities, and maintenance should be carried on according to the best engineering practices. Of equal importance should be considered the question of accurate records of opera-

tion and maintenance, and these records should include every item of expense, and they should be frequently analyzed in order that the department head may know exactly what the trucking proposition is costing and in order that he may, by such analysis, bring about even greater efficiency.

### Express Company's Experience.

Following the idea outlined above, the express companies, now merged into one—The American Railway Express Co.—commenced buying motor vehicle equipment in 1907. We are now operating 1058 electric trucks in 23 cities—an average of 43 per city. From our experience and observation we are firmly convinced that, in its particular field, the electric is the most economical, reliable and efficient vehicle in operation today. This is especially true where the truck is operated in service where the hauls are short, stops frequent and freight abundant, because they are easy to control, they are extremely simple, their action is positive while in motion, and they require absolutely nothing while standing. The fact that the driver in the express company's service is an expressman and not a chauffeur shows conclusively that the electric has many advantages, and these advantages always appeal to the operator. Relative to the question of economy, efficiency and dependability of the electric, I submit the attached recapitulation of six months' cost of operation and maintenance of a fleet operating in an extreme eastern city, a north-central city and a south-central city. In each case they have been operated for a number of years, during a time when cost of operation has been highest. If these reports are used as a basis for making comparisons there should be no doubt of the ability of the electric to fill the bill.

Electrics are not affected by extreme weather conditions—cold, hot, wet or dry—and we have found them to be entirely capable of manipulating heavy grades as are found in such cities as Kansas City, Mo., St. Louis, Minneapolis, Denver, and other places equally hilly. They are used by the American Railway Express Co. generally in congested districts, but we have no hesitancy in placing the larger capacities such as the 3½ and 5-ton on what we know as transfer service, where the run is continuous from one point to another and where the loads are heavy, distances making no difference as long as the day's mileage does not exceed 40 miles, which we have found to be about the capacity of batteries properly selected.

### Selection of Battery.

Batteries should be selected with the same care by a capable engineer in order that trucks may not be equipped with batteries of too little capacity, and at the same time in order that they might not carry excess weight by being equipped with over-capacity batteries.

After batteries have been selected careful attention should be given to the installation of charging apparatus, and we have always found battery manufacturers willing to lend every assistance in installations of this kind. We have particularly noticed that the electric light and power companies' contract and engineering departments have been very willing to co-operate with us, and in some cases have actually looked after the installations from the engineer's standpoint, and in my dealings with these departments I have always found them keenly interested in the electric truck proposition and glad to see the electric truck making progress. We are pleased to say, also, that we have no complaint to make regarding rates, especially where it has been possible for us to contract for current on the off-peak schedule, and I believe I can say, without violating any confidence, that where we have a number of electric trucks in one fleet and purchase current direct from the central station, the rate is never higher than 2.3 ct. per kw-hr., and in some cities it ranges as low as 1½ ct. per kw-hr. We can say, further, that where we obtain service from a local garage we find that the rate charged for current, which is generally on a continuous service basis, is consistent and reasonable, and I know of no case where we have been seriously bothered by interrupted service. Taking into consideration the abnormal period all industries have passed through recently, the fact that the central station gave us continuous service seems to indicate highly efficient management, and we, the largest users of electric trucks in the world, are truly grateful to them.

Another thing that may be said in favor of the electric is that, considered from the standpoint of safety, it is superior to any other type of vehicle. Our records show that the electrics are entirely free from excessive speeding, which is exceedingly dangerous to life and destructive to property, and with the greatly increased use of trucks our roads are showing the destructiveness of high speed, heavy motor trucks, due almost entirely to the selfishness of the operator whose "get there at any cost" attitude places the superior, economic advantages of the modern motor truck in a false position. The advantage of the electric is that, with the possible exception of coasting down grades, it cannot be driven at an excessive rate of speed. Head-on collisions are the exception rather than the rule, and in reviewing our accident reports we find the electric rarely implicated. This, we believe, is due to its simplicity and ease of control, and especially to its continuous and even rate of speed, there being no chance for the operator to perform in a spectacular manner, therefore no sudden bursts of speed which is very likely to result in trouble. The continuous torque of the electric motor, or the cushioned application of power, makes skidding with the electric practically an unheard of thing, and the fact that the electric can be operated with the minimum demand on the mental and physical abilities of the driver makes it most advantageous from the standpoint of safety.

Another advantage in favor of the electric is that it is practically free from fire hazard. While we have had electric trucks on fire and some of them seriously damaged by fire, we know that these were due to the failure of the human element and not chargeable to the truck itself. Since the human element to a certain extent is beyond our control, we believe the electric is the safest type of vehicle from the standpoint of fire hazard, all of which, of course, enables us to insure them at a much lower rate than other types of vehicles.

### Electric Truck Has Long Life.

We have found the electric capable of standing up in the service for a period covering some eleven years, as we still have in operation some of the electrics which were purchased in 1907. As a matter of fact, the electrics being manufactured today should, I believe, be operated economically for as long as twenty years. There are comparatively few wearing parts, and since they are generally rotating instead of reciprocating parts, and since lubrication of all wearing parts is positive by the simple method of replacing a

few of the worn parts, I see nothing to hinder continuous operation for a very long period, and while these electrics are being operated for a very long period the user does not have to invest heavily in parts or repair material, and the operator will find that in a shop properly organized the electric can be overhauled when necessary in a very short time. The American Railway Express Co. frequently overhauls and paints an electric truck in six working days, thus materially reducing the days out of service, and taking this into consideration and the electric's freedom from accident troubles, we have found it possible to operate them easily 280 out of a possible 300 working days.

The fact that electric trucks have proven so satisfactory in the service of the express company, brewers, department stores and to many other concerns who have used them extensively, should be conclusive proof of their dependability, but they seem to be surrounded by an air of mystery which, I believe, could easily be removed by co-operation on the part of the electric truck manufacturer, the battery manufacturer and the central stations, by the simple method of furnishing detailed information through advertising or, perhaps better still, by providing field engineers who could devote their time to the intelligent analysis of trucking propositions. I believe that all concerns having a trucking proposition to solve would be glad to have a transportation engineer undertake an analysis of their trucking propositions and would use the electric to a very great extent as soon as they were shown its advantages. In this I believe the truck manufacturer and the battery manufacturer should take the initiative because they have the products of their factories to dispose of. On the other hand, while the truck manufacturer and battery manufacturer accomplishes a sale, that sale must be looked upon as a single sale as they may not sell another; whereas the installation of an electric truck creates a continuous demand for electricity sold by the central station, and inasmuch as a truck battery is usually charged during the night, or the off-peak period, it seems to me that the central station should be interested in getting more and more of this kind of business, which must act as a balance wheel, or to straighten out their daily load curve.

Looking at the proposition from every angle, all three should be keenly and probably equally interested in electric truck sales.

| 1918. | Days in service | Total mileage | Electricity | Battery repairs | Tire repairs and renewals | Painting | Body repairs | Chassis repairs | Garage expenses | Total expenses |
|---|---|---|---|---|---|---|---|---|---|---|
| **BOSTON** | | | | | | | | | | |
| July | 23 | 438 | $ 9.70 | .... | $ 5.88 | $ .74 | $ 4.64 | $ 33.67 | $ 37.50 | $ 92.13 |
| August | 23 | 429 | 10.43 | .... | 7.16 | .57 | 4.72 | 43.64 | 36.06 | 102.58 |
| September | 23 | 725 | .49 | .... | 1.79 | .56 | 4.93 | 30.00 | 35.30 | 73.07 |
| October | 23 | 441 | 22.56 | .... | 10.21 | .77 | 6.35 | 25.45 | 34.36 | 99.70 |
| November | 23 | 449 | .37 | .... | 7.33 | .58 | 4.46 | 28.47 | 36.38 | 77.59 |
| December | 23 | 460 | 13.48 | .... | 11.64 | .67 | 5.79 | 37.17 | 42.01 | 110.76 |
| Average cost 6 months | 138 | 2,942 | $57.03 | .... | $44.01 | $3.89 | $30.89 | $198.40 | $221.61 | $555.83 |
| Average cost per month | 23 | 490 | $ 9.50 | .... | $ 7.34 | $ .65 | $ 5.15 | $ 33.07 | $ 36.93 | $ 92.64 |
| **CLEVELAND** | | | | | | | | | | |
| July | 23 | 487 | $10.11 | $11.02 | $ 6.24 | .... | $ .96 | $ 29.23 | $ 11.46 | $ 69.02 |
| August | 24 | 500 | 11.67 | 19.61 | 3.69 | .... | .34 | 22.11 | 13.42 | 70.84 |
| September | 22 | 486 | 10.12 | 10.98 | 1.09 | .58 | .23 | 18.02 | 17.31 | 58.33 |
| October | 23 | 495 | 9.51 | 17.63 | 4.37 | 1.65 | 6.48 | 21.54 | 18.06 | 79.24 |
| November | 21 | 499 | 8.90 | 13.01 | 6.67 | 3.35 | 9.91 | 29.82 | 16.21 | 87.87 |
| December | 24 | 503 | 10.22 | 2.08 | 3.92 | 2.69 | 10.59 | 31.60 | 9.23 | 70.33 |
| Average cost 6 months | 137 | 2,970 | $60.53 | $74.33 | $25.98 | $8.27 | $28.51 | $152.32 | $ 85.69 | $435.63 |
| Average cost per month | 23 | 495 | $10.09 | $12.39 | $ 4.33 | $1.38 | $ 4.75 | $ 25.39 | $ 14.28 | $ 72.61 |
| **MEMPHIS** | | | | | | | | | | |
| July | 25 | 633 | $24.09 | $ 4.24 | $ 4.08 | .... | $ 1.84 | $ 3.24 | $ 18.76 | $ 56.25 |
| August | 38 | 677 | 26.17 | 8.16 | 2.04 | .... | 5.08 | 2.61 | 18.76 | 62.82 |
| September | 24 | 609 | 24.53 | 3.44 | 4.18 | $3.13 | 3.25 | 2.10 | 18.76 | 59.39 |
| October | 25 | 631 | 26.09 | 6.32 | 14.80 | 2.50 | 8.98 | 10.32 | 18.76 | 87.77 |
| November | 22 | 550 | 21.40 | 19.60 | 9.94 | .... | 9.08 | 2.68 | 17.50 | 80.20 |
| December | 22 | 543 | 20.93 | 5.32 | .... | 2.22 | 11.82 | 2.31 | 16.81 | 59.41 |
| Average cost 6 months | 156 | 3,643 | $143.21 | $47.08 | $35.04 | $7.85 | $40.05 | $ 23.26 | $109.35 | $405.84 |
| Average cost per month | 26 | 607 | $23.87 | $7.85 | $ 5.84 | $1.31 | $ 6.67 | $ 3.88 | $ 18.22 | $ 67.64 |

The foregoing compilation is a recapitulation of average cost of operation of a single electric vehicle, taken from the reports received by the American Railway Express Co. from three cities, representing the eastern, central and southern parts of the country. These averages are obtained by dividing the number of trucks operated in the fleet into the total number of days in service, total mileage, electricity cost, battery repairs, tire repairs and renewals, etc., covering a period of six months, from July 1, 1918, to December 31, 1918, for each city; also the total aggregate cost of operation of one "electric" for the entire six months and the average cost per month of operating one vehicle based on the figures for the six months, for which see foregoing table.

[The above paper, presented by Mr. LaSchum at the convention of the National Electric Light Association held recently at Atlantic City, attracted a very large amount of interest and discussion because of the weight carried by Mr. LaSchum's statements, and the authentic data as to electric truck performance. Mr. LaSchum tells the central stations to go after the load represented by the electric truck. He tells the truck manufacturers to co-operate with the central stations and help along a good cause. This article is not propaganda; it deals with facts. It deals with transportation placed upon a dollar and cent basis.—EDITOR.]

# Terms Used in Rate Cases Defined

## Second of Twelve Articles on Electric Utility Valuation and Rates—Importance of Accurate Knowledge of Terms Most Commonly Used in Rate Cases—Principal Terms Defined

By CHARLES W. McKAY

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IN THE first installment of this series the various methods of ascertaining the rate-base value of electric utilities were discussed, albeit in a very general way. The thought was suggested to the reader that, with the lack of conclusive evidence to the contrary, the reproduction method afforded the fairest method of determining the value of electric utility properties. Before proceeding with the discussion of the subject of reproduction-cost values, it may be well to give the reader some idea of the real meaning of the various terms used in electric utility rate and valuation work.

The writer knows that this phase of the subject may prove somewhat dry to the readers of this series, but his past experience has proved conclusively that it is most essential that operating utility executives shall have at least a fundamental knowledge of the terms used in electrical utility valuation work. The writer knows of many instances where a most intelligent and up-to-date utility manager has been made the scapegoat of a utility rate case, due to the fact that he has displayed utter ignorance of the real meaning of valuation terms in his testimony before public service commissions and courts. It is hoped, therefore, that the reader will disregard the seemingly highly technical—and therefore uninteresting—nature of the present discussion and apply himself diligently to the acquisition of a thorough understanding of the real significance of appraisal terms. The writer can vouch for the fact that, if the reader should be exposed to the most undesirable ordeal of testifying before public service commissions or courts, he will be amply repaid for the time spent in perusing this installment.

### Need for Exact Knowledge of Rate Procedure.

*GREATER need exists now probably than ever before for the managers of public utilities to present with exceptional care any rate questions that must be submitted to public service commissions or the courts. The continuance of high operating costs simultaneously with public appeals to reduce rates or efforts to prevent further necessary rate increases compel the utility to be prepared with not only all the facts bearing on its case, but also to have an accurate knowledge of rate-case procedure in order to avoid falling into a trap cleverly set by opposing counsel.*

*One of the objects of this series of articles by Mr. McKay is to furnish information on present rate and valuation procedure to meet the needs of the busy manager who has not taken the time to acquaint himself therewith. The first article, in the issue of May 17, served as a general introduction to the modern practice of utility regulation by commissions. The terms now most commonly used and which must be properly comprehended to be intelligently used, are defined in the present article. Future articles of this series are to appear in the first and third issue of each month.*

*These articles constitute only one feature of a Rate and Valuation Department being organized for our readers by Mr. McKay. Other features will be to discuss current rate cases with a view to pointing out their possible application to readers, also to act as a clearing house for questions which may occur to readers as to the administration of their own rate and valuation problems.*

### Fundamental Definitions.

This whole science of appraisement of electrical utility properties is so new that it is but natural that a difference of opinion should arise, even among experts, as to the proper definition and application of the various terms commonly used in electrical and other public utility rate and valuation matters.

The following glossary of appraisement terms is the result of some 10 or 12 years' study, on the part of the author, of the best practice adopted by the various commissions and by the leading authorities on electrical utility rate and valuation matters.

There are certain preliminary definitions which must be thoroughly assimilated in order to understand the subsequent installments of this series. These definitions are primarily a function of the subject of economics.

*Utility.*—The Standard Dictionary defines the word "utility" as "The quality, character or state of being useful or serviceable; fitness to supply the natural needs of man; that serviceableness which is the basis of the value of a thing."

As far as we are concerned, in the consideration of the subject of electrical utility rates and values, the keynote of the real meaning of the word "utility" is sounded by the phrase "character or state of being useful or serviceable." This phrase rather implies that the service referred to is that of some more or less tangible commodity.

Public utility corporations, therefore, are those corporations which furnish the public with such commodities—if we may use this term—as transportation, electric light, electric power or telephone service. In other words, the commodity sold to the public is "service," hence the companies dispensing this service are frequently known as public service corporations.

*Property.*—Perhaps the next most important fundamental definition is that of property. Property has been defined as the "legal right to possession, use, enjoyment and disposal of a thing." The term "property" as applied to electrical utilities may be subdivided into two component elements: First, physical or tangible property, and second, intangible property. It is thought that these two terms will be self-explanatory; however, this whole subject will be discussed in detail in subsequent installments.

For the present, suffice it to say, the physical prop-

erty of an electrical utility corporation consists of its strictly material assets, such as land, buildings, tracks, rolling stock, pole lines, primary circuits, secondary circuits, underground subways, etc.

The intangible property consists of such items as franchise privileges, going values, etc.

*Value.*—This leads us up to a definition of the term "value." The terms "value" and "cost" are frequently used synonymously, and most improperly so. Cost may represent value; reversely, value may or may not reflect cost.

A very old and reliable definition of value is the following: "Value is the Latin term corresponding to the Saxon 'worth.' The fundamental idea which underlies 'worth' is the capacity to satisfy a want. If we need a nail and find a broken one, we may say that nail is worthless, that is, it is valueless or not valuable for the purpose we have in mind. Value or worth thus implies usefulness or utility. * * * As a preliminary definition, then, we may say that the value of anything is the exposition of our estimate of its utility, meaning by utility its capacity to satisfy human wants. Value * * * has a meaning only when attached to the definite quantity of an article. The value of iron means nothing; the value of a ton of iron means something."

This definition is taken from Prof. Edwin R. A. Seligman's "Principles of Economics," pages 173, 175 and 181. This definition has become an axiom in electric utility valuation work. Nevertheless, while the definition serves excellently to convey the real meaning of the term value, it has one error: The "broken nail" referred to in Professor Seligman's definition of course ordinarily would be useless and therefore valueless; however, if this particular nail happens to be in a junk heap or scrap pile, it, together with the rest of the contents of the scrap pile, would have a certain value. Of course, the value of the broken nail would in itself be infinitesimal. Nevertheless, in connection with the rest of the contents of the scrap heap it would have a certain value.

In this connection it is interesting to note that value is largely influenced by scientific development.

Certain articles which a few years ago were absolutely valueless, today have a very real value. To illustrate: Many plants some years ago entirely disregarded by-products of manufacture. Today, however, these same plants are giving the utmost attention to the utilization of these by-products and in many cases they (the by-products) have become a real and tangible monetary asset. Take, for instance, the case of coal tar. Twenty-five years ago it was considered an entirely useless by-product of certain manufacturing processes. Now, however, with the development of analytical chemistry, coal tar is used in a large way for the manufacture of certain well nigh indispensable drugs, such, for instance, as verinol, sulphonal and trional.

In other words, value in the last analysis must be largely predicated upon use, or, to put the same thought in modern commercial phraseology, upon the amount of money which may be obtained from its sale.

*Cost.*—This word "cost" is used in many senses. As previously pointed out, it is often used as the synonym of value. This, obviously, is wrong; referring again to Professor Seligman, I think we can derive a very clear meaning of the word "cost." Cost is used in a variety of senses. To the consumer cost means price. If a thing costs a dollar, he means that the price is a dollar. To the producer, cost means total outlay expended in production. Here the cost is usually less than the price, the difference between the cost and price being profit. A machine may cost the builder $10, but he may sell it for the price of $12. To apply this definition to the present subject of electric utility valuation and rates, it may be said that the cost of any item of an electric utility plant is the price paid for that item plus the amounts expended for freight and installation.

*Appraisal.*—There is one more fundamental definition which should not be overlooked in discussing this subject of electric utility rates and values.

The word "appraisal," according to the Standard Dictionary, is the "act of appraising valuation, especially official valuation, as of an estate, etc."

This term is also used to describe a report presenting the results of the valuation of a property. It is thought, however, that the term appraisement better fits this case.

## Derivative Terms.

There are certain terms prevalent in electric utility rate and valuation practice before commissions and courts which are derivatives, or modifications, of the terms defined in the foregoing paragraphs. These terms will be discussed briefly.

*Fair Value.*—Regardless of the method used in the appraisement of an electric utility property, the ultimate object is the determination of a value which will be fair to all concerned. Just what constitutes fair value has been long a bone of contention between electric utility valuation experts. In the case of the *Covington & Lexington Turnpike,* 164 *U. S. Supreme Court,* the Court has set forth the following factors for consideration in the determination of fair value:

1. Original cost.
2. Amounts expended in permanent improvement.
3. Market valuation of outstanding stocks and bonds.
4. Reproduction cost.
5. Probable earning capacity.
6. Operating expenses, in relation to the corresponding operating revenues.

Obviously, all of these items, in so far as possible, should be considered in the determination of the fair value of electric utility properties for purposes of rate-making.

*Physical Value.*—It has been previously suggested that the appraisement of an electrical utility property may be divided into two major classifications: The determination of the value of physical property and the determination of the value of the intangible assets.

A short and concise definition of physical value is the following: The value of that portion of a property which can be "seen and felt" and which is "capable of being inventoried."

In other words, the physical value is the value of that portion of the property which is determined by the pricing out of the inventory of the physical or tangible assets.

*Original Cost.*—The foregoing discussion of the subject of original cost obviates the necessity of a definition of this term. The meaning of the term is self-evident. The amount paid for an item of plant plus cost of freight and installation constitutes the original cost.

*Collateral Cost.*—There are many items which enter into the valuation of the physical property which are not directly related to the appraisement of the inventory. Among these items may be cited:

1. General and legal expenses during construction.

2. Engineering and general supervision during construction.

3. Taxes and insurance during construction.

4. Interest during construction.

These items are usually termed collateral construction cost.

It is thought that the reader will grasp the significance of this item best in conjunction with those subsequent installments which deal specifically with this particular phase of the subject.

*Reproduction Cost.*—Reproduction cost, as the term implies, is the cost of replacing the property as found at the date of appraisement at costs prevalent at the appraisal date.

It is thought that it will be unnecessary here to enter into detailed definition of reproduction cost in view of the preliminary discussion given in the foregoing installment. This whole question, however, will be made the subject of a future installment of this series.

*Unit Cost.*—It is but natural that the appraisement of an electric utility property will involve the pricing out of a large number of homogeneous items. For instance, a certain company may have several thousand 30-ft. poles and perhaps an equal number of poles of other sizes. Rather than price out each pole separately, it is customary to derive a certain cost which may be applied to any group of homogeneous poles, or to any group of homogeneous equipment. Such a cost is termed "a unit cost." For instance, if we find that the thousand 30-ft. poles above referred to were purchased under exactly similar circumstances and, to all intents and purposes, are practically the same, we may derive a certain cost per pole which will apply to any pole in the group. This cost will be "a unit cost."

*Scrap Value.*—Henry Floy, the pioneer of the subject of electric utility valuation, said: "All physical property has a certain scrap, or junk, value—a minimum basis beyond which there is no depreciation; hence, physical property can only deteriorate until it reaches a scrap value."

In other words, nearly every item of electric utility property has a certain value if disposed of to the junk dealer.

The disposal of such property, however, to a junk dealer may involve a certain cost. The net cost—that which the junk dealer pays for the property—is the scrap value.

*Salvage Value for Re-use.*—It sometimes happens that due to obsolescence and inadequacy (it is thought that the significance of these terms will be familiar to the readers of this series) there is a necessity for the retirement of plant before it has reached the end of its useful life, from the standpoint of age and wear and tear; in such cases it is customary to sell the plant and to replace it by something more modern and up-to-date and in this case the revenue derived from the sale will necessarily be appreciably higher than the scrap value. Such revenue is usually known as salvage value for re-use.

*Wearing Value.*—The difference between the cost—whether it be determined on original-cost or reproduction-cost basis—and the scrap value is known as the "wearing value." In other words, the wearing value is that portion of the total value of any item of the plant which entirely passes out of existence during the useful life of that item. To illustrate: A machine costing $1000 is sold for $100 as scrap. The difference between the cost and the scrap value is $900; this $900 constitutes the wearing value.

*Service Value.*—It sometimes happens that machinery and equipment, which is obsolete and which is nearly worn out, is still retained in service. Theoretically, from the standpoint of the appraiser, it has only a scrap or salvage value.

Nevertheless, the mere fact that it is giving service warrants a higher valuation than the mere scrap value. The value thus assigned is known as the service value. To illustrate: Referring to the example cited in the foregoing paragraph, the machine costing $1000 and having scrap value of $100 may have so deteriorated that it has reached the point where it is good operating practice to junk it—for $100—but for some reason, possibly delayed deliveries on the part of the manufacturers of similar equipment, it has been retained in service; therefore, instead of appraising it at $100, the appraisal engineer will in his valuation ascribe to this particular machine a slightly higher value; let us say, for the sake of illustration, $200 or $300.

The value as thus assigned would be the "service value," rather than the scrap value.

We have now covered the explanation of the terms in current use in electrical utility rate and valuation work. The writer again recommends that the reader carefully review these terms, with the thought that a thorough familiarity with them may obviate subsequent embarrassment in testifying before public utility commissions and courts.

It is a known fact that opposing counsel are prone to use every effort to disqualify witnesses on the ground that they are incompetent to testify to the subject in hand. The misuse of electric utility rate and valuation terms may give the opposing counsel the opportunity they are keenly looking for.

## PENNSYLVANIA ENGINEERS DISCUSS HEAT TREATMENT.

On May 20 a joint meeting of the Engineers' Society of Western Pennsylvania and the Pittsburgh Section, Heat Treaters Research Society was held in the auditorium of the Union Arcade building, Pittsburgh. The principal feature of this meeting was a paper presented by T. D. Lynch, research engineer, Westinghouse Electric & Manufacturing Co., on heat treatment of steel, illustrated by lantern slides. In his paper Mr. Lynch discussed material in design; standardized treatments; results of standard heat treatment; special grades of steel and special treatment and heat treatment of United States common steel shells, the latter embracing heating furnace and quenching devices, water treatment of 6 and 8-in. shells, and oil treatment of 6 and 8-in. shells.

## FORT WAYNE SECTION, A. I. E. E., ELECTS OFFICERS.

Officers of the Fort Wayne Section of the American Institute of Electrical Engineers, for the coming year of 1919-1920, were elected as follows: C. I. Hall, chairman; O. B. Rineheart, secretary-treasurer; and W. S. Hall, W. Howard Miller, A. F. Welch, E. A. Barnes and P. C. Morganthaler, members of the executive committee. These officers will be installed the first of August and will preside over the first meeting of the year to be held in September. The Fort Wayne section is composed of 75 members and is in a satisfactory condition, both in membership and in interest taken in the work, the program for the past year having been interesting and helpful.

# Standard Practice of Hand Firing

## Methods of Hand Firing — Recommendations for Firing — Keeping the Fuel Bed in Proper Condition—Banking Fires

By ROBERT JUNE

*Mechanical Engineer.*

OF THE various sources of coal waste in the power plant, improper firing is among the most important. Also, given a fair measure of intelligence, good intention and determination to improve operation on the part of the boiler-room crew, improper firing may be easily bettered.

There are two general methods of hand-firing; first, the spreading method; second, the coking method.

In the spreading method a small amount of coal is fired at one time and spread evenly over the fuel bed, front to rear. In order that the entire fire may not be blanketed with green coal, the surface of the bed is divided into sections which are fired alternately. Thus on a furnace with three firing doors, the rear half of the grate is fired through doors 1 and 3, and the forward half through door 2, at the same time. At the next firing, the arrangement is reversed and the forward half of the grate fired through doors 1 and 3 and the rear through door 2.

In the coking method, fresh coal is fired to a considerable depth either over the entire front half of the furnace or along one side. This coal is allowed to remain for some time until it is well coked. It is then pushed to the back of the furnace or to the opposite side, the object being to maintain a section of the furnace at white hot heat in order that the volatile gases from the green coal may be thoroughly burned.

Of the two methods, it may be said that modern practice leans more and more to the spreading method. This is because of its evident tendency to produce higher efficiency, higher $CO_2$, lower flue-gas temperature and more uniform steam generation—results attributable to greater constancy in furnace temperatures.

On the other hand, the coking method produces less clinker since the levelling of the fire at the firing period shakes more ash through the grates. The longer firing period produces a general lowering in $CO_2$ and there is a tendency to admit excess of air through the thin spots. The coking method cannot be used successfully with a fluctuating load as holes which cannot be seen develop in the rear of the fuel bed.

### Standard Practice for Hand Firing.

The position of the fireman and the location of the coal pile have a great deal more to do with securing good results in hand-firing than is generally supposed.

The position of the fireman must be such that he can see the entire fuel bed and at the same time throw coal easily wherever it may be required. The preferable position is 4½ to 5 ft. in front of the furnace and 12 to 18 in. to the left of the center of the door. (Fig. 1.)

The coal car or platform should be not over 2 ft. away. It is very desirable that the floor of the car or platform from which the fireman shovels be at an elevation of 18 to 20 in. from the floor on which he stands.

A straight line is the shortest distance between two points, therefore the fireman should see that the direction of travel of his scoop approximates at all times the center line of the fire door. This is the least tiring motion. It is also the one which gives the greatest command of the scoop. A great deal depends upon the termination of the fireman's throw. If he lands it with a smart tap upon the bottom edge of the door frame, it will fly off and spread itself properly. (Fig. 2.)

If the fireman, however, does not mind his stroke and allows it to terminate inside the furnace, in mid-air, he will not only wear himself out physically but will not maintain a good fire. This may seem like a small point to emphasize, but it is surprising to find men who have been firing for considerable periods of time who do not handle even so simple a tool as a shovel properly. Remember that hand-firing is hard work and that it calls for the exercise of both skill and muscle.

Be sure that the fireman is not forced to work in cramped quarters. The 6 or 7 ft. mentioned between the coal pile and the fire door is none too much. If

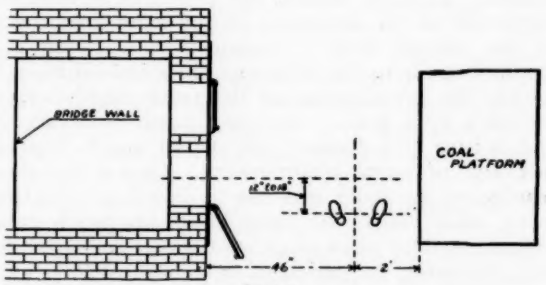



Fig. 1.

the coal is brought nearer the fireman is forced to stand away from his proper position, not only to avoid the heat, but also to get the proper swing to his scoop. (Fig. 3.)

There is another point of apparently minor importance but upon which a great deal of the fireman's muscular efficiency depends; that is, whether or not a smooth floor is provided, free from all obstructions in the coal car or on coal platform. If the fireman's shovel must encounter rivets on the floor, he has continually to make extra motions to handle his scoop thus not only using extra muscular effort but losing valuable time during which the fire doors are open and cold air in large quantities is passing into the furnace.

It is best to fire small quantities of coal at frequent intervals. When this is done, thin spaces in the fuel bed can be caught before they are burned through and admit large quantities of cold air.

Depending upon grate size and draft, coal can be best fired in quantities about as follows: Two pounds, or a trifle over, per square foot of grate surface is good standard practice with a 1-in. draft. On a grate 7 by 9 ft., 125 to 250 lb. of coal, or approximately

9 to 10 shovels, would be about right for a single firing. Intervals between firing in this case would be 5 to 6 minutes. With lower draft, this could be increased to 8 or 9 minutes. Firing by the clock at regular periods is one of the very best ways in the world to insure good results with hand firing. This regularity possesses the important advantage of keeping the fuel supply practically proportional to the air supply.

The frequent firing of light quantities of coal rather than the firing of heavy quantities of coal at longer periods is desirable for a number of reasons. As coal reaches the fuel bed the white heat of the furnace causes the almost immediate distillation of

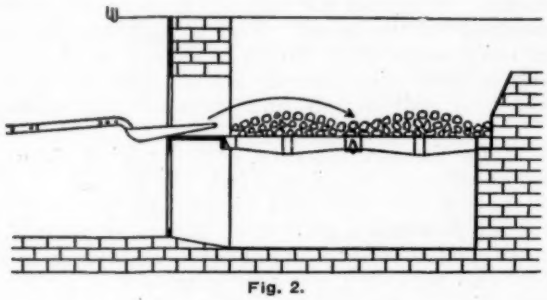


Fig. 2.

the volatile matter, the process taking but 2 or 3 minutes at most for practically complete distillation. To insure the complete combustion of volatile matter we, therefore, require a very large quantity of air at the moment of greatest rate of distillation, with a decreasing quantity of air as the rate of distillation decreases. It is, of course, not practical to have such regulation of the air supply in any hand-fired furnace of the present date. Consequently, a condition of insufficient air in the furnace occurs immediately following the introduction of the fresh supply of coal, followed by a period when air supply is about right and in turn by a period when the air supply is greatly in excess of actual requirements. Thus a loss due to insufficient air and a loss due to excess of air at each firing takes place. As these losses are much greater proportionately when large quantities of coal are fired and, following the period of distillation, allows longer periods of excess air, it follows that the more nearly continuous firing of small quantities of coal can be approached, the better results will be obtained.

If attempt is made to use automatic air control devices it must not be presumed that their use permits of any laxity in firing. They may make good firing better but they will not make poor firing good.

### Cover Up the Thin Spots.

Good hand-firing is a matter of skill and experience. It involves placing just the proper quantity of coal, of just the proper coarseness or fineness on exactly the right spot of the fuel bed at precisely the right time. It is a pleasure to watch a good fireman in action. Almost mechanically he reaches for coarse coal to build up the general level of his fuel bed, thus avoiding loss of fine coal through the grate. When he finds a thin spot with air rushing through, he first pushes incandescent coal over the spot from another part of the fuel bed before throwing on green coal. In throwing green coal on a thin spot he uses fine material and builds up the spot gradually rather than trying to fill it all at once with a large quantity of green coal. If he were to pile in a large quantity of green coal on a thin spot he would create a new high spot. If he finds a high spot in his fuel bed he examines it with the bar for clinkers. Only by exercising that care which is a development of real interest in his work does the fireman obtain effective results; therefore, every incentive should be offered the fireman to do his work well.

### Thickness of Fire.

The resistance of the fuel bed to the passage of air varies almost proportionately with its thickness. It follows that a thin fuel bed is necessary where high capacities are required, since the rate of combustion is in such cases largely dependent upon the amount of air which can be brought through the fuel bed. Under normal conditions, with a medium-sized boiler operated at normal rating, firing run-of-mine coal, a 4 to 8-in. fuel bed represents the practical minimum and maximum thicknesses. Preferably under such conditions the fuel bed should be under 6 in. thick. Where trouble is experienced in maintaining steam pressure, the first point of investigation should be the fuel bed. The trouble can probably be eliminated by cutting down on the thickness of fuel bed. Remember that unless there are holes in the fuel bed, oxygen will not pass through even a very thin bed without being burned. The Bureau of Mines is authority for the statement that there is not more than 2% oxygen in the gases arising from a fuel bed 3 to 4 in. thick, whereas there is 25% combustible gas. This means then, that a thin fuel bed need not be feared and that with both a thin bed and a thick one it is necessary to admit a considerable quantity of air over the fire in order to furnish the necessary oxygen to complete the burning of the combustible gases arising from the fuel bed.

### Abating the Smoke Problem.

Hand-fired furnaces, as a rule, are most obstinate smoke-producers. Although they can be operated efficiently without the production of objectionable smoke, the result depends more upon the fireman than upon the design of the furnace. The chief difficulty with

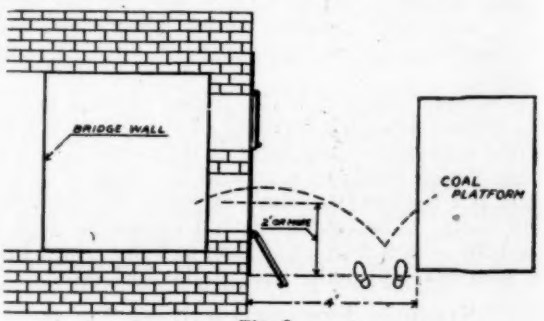



Fig. 3.

hand-fired furnaces lies in the intermittent nature of the firing. When a fresh charge of coal is fed into the furnace, an enormous volume of volatile matter is evolved. For complete combustion, a corresponding amount of air must be supplied and intimately mixed with the comparatively cool heating surface. In the average hand-fired furnace, the combustion chamber is so small and the heating surface is so close to the grate that the partly burned gases strike the heating surface before oxidation is complete and combustion is hindered or even completely arrested. The most economical and smokeless hand-fired plants are those that approach the continuous feed of the mechanical stoker.

Two methods of cleaning fires in hand-fired furnaces are in general vogue. In the side method, one side of the fire is cleaned at a time. In the front-to-rear method, the burning coal is pushed with the hoe against the bridge wall, the clinker from the front half of the furnace is loosened and pulled out, and the burning coal is spread over the bare grates, the process then being reversed for the rear half of the furnace. For smokeless operation, the side method is preferable and should be carried out as follows:

Build up the fire on one side and let the other side burn down. Just before cleaning, "wing" over the live coal from the burned-out side and pull out the clinker and ash, cleaning the grates thoroughly. Cover the clean grates with green coal and push over live coal from the other side. When the cleaned side has become thoroughly ignited and the volatile matter has passed off, throw in coal to fill the spots not covered and pull the clinker and ash out of the other side. Cover the grates with green coal as before, winging over the live coals from the opposite side. Keep the panels open and allow the fresh coal to ignite thoroughly. Never allow the fire to burn low before cleaning if carrying a heavy load, as there is a possibility of losing the steam pressure.

### Keeping Down Smoke in Banking Fires.

The following rules, suggested by Osborn Monnett, represent the best standard practice in eliminating smoke in banking fires: Throw 15 or 20 scoops of coal on each side. Open the panel doors slightly, close the ash-pit doors and partially close the damper. To break up the bank, level the fire, with the panel doors open, and start firing by the usual method, making sure the damper is wide open.

Keep the fire bright by the spreading method, using the panel doors and steam jets, and regulate the steam pressure with the ash-pit doors. This insures a temperature in the furnace high enough to maintain the brick work at the igniting point of the coal and promotes combustion of the volatile matter. At the same time, it keeps down the distillation of the volatile matter to a low rate, and by having the damper open and the panels cracked, the circulation of the gases is not retarded. Do not try to regulate the steam pressure by the damper or smoke will be produced.

The method just described is contrary to the general rules for firing but its philosophy is explained in the following manner: If a shovel of coal is thrown on a bright fire by the spreading method, every particle of the coal is immediately subjected to the intense heat of the fire and the volatile matter is rapidly driven off. If this is followed by more coal, the result is a volume of volatile matter which is beyond the capacity of the furnace to handle without dense smoke.

If, on the other hand, the fuel is fired in a lump from the shovel without spreading, there is a considerable quantity of the coal which does not immediately become subjected to the high temperature. The coal on the outside of the pile gives up its volatile and the coal within is not affected until the volatile matter has been distilled from the outside lumps. Furthermore, the volatile matter from the inner portions of the pile must pass outward through the incandescent outer layers of fuel, much in the same way as in the underfeed stoker. In this way the production of smoke can be retarded and the more coal thrown on the fire at once, the less smoke. Two shovels of coal fired by the spreading method on a clean bright fire will make more smoke than 10 shovels of coal fired by the lump method. In practice, it will be necessary to determine just how much coal should be fired at once, but 6 to 8 shovels on a side with the draft operated according to the method ordinarily used will be found about right.

When a battery of boilers is to be fired, the fires should be fed by the alternate method as before, passing from one boiler to another until they are all charged and then repeating on the other side of the furnaces. It should be determined by experiment, however, just how many furnaces can be fired consecutively without producing dense smoke, and after this has once been made known, the fireman should adhere strictly to the rules laid down in this regard.

## IMMEDIATE RESUMPTION OF PUBLIC BUILDING URGED.

### National Federation of Construction Industries Proposes Concentrated Program.

Recent reports compiled by the National Federation of Construction Industries indicate that, after a protracted period of hesitancy on the part of consumers of construction materials, business is now steadily increasing. This partial resumption of construction has not been accompanied by a decline in material prices. Between October and March there was a very slight decrease in the prices of some commodities. Since March, prices in many lines have advanced.

The advances in prices of construction materials have in some instances exceeded the average in other lines owing to the fact that the composite advance in the prices of construction materials was only 84% in November, 1918, as compared with an average advance in the prices of all commodities of 116%, due to building inactivity during the war. Business men now generally concede that the nation is on a permanently higher price level and construction material prices are at this time slowly rising to that level. This fact makes it practically certain that the cost of construction will steadily advance during the next several months until they reach the new level, after which they will fluctuate within narrow limits.

Investigation reveals the regretable fact that the increase of building construction during the past few months has been due to private initiative and not to the construction of public works. While the bolstering up of prices by useless public expenditure is always to be discountenanced, it is generally admitted that the construction of public works would facilitate the resumption of general business. To this end, the Federation proposes that the public works programs which normally would be extended over the next several years be concentrated into the immediate future. The saving to the country resulting from a quick general resumption of normal business, following the stimulus of large public activities of a legitimate nature, will many times offset the saving effected by the policies of retrenchment or very limited purchase.

There is but little if any doubt that the next few years will be a period of great activity and prosperity. Such being the case, a less than normal amount of public works construction during these years would be highly in order because labor and industry would be fully employed with private affairs. But in the meantime and until the business of this country has gotten back to a normal basis, the Congress of the United States and the several states and municipalities should take up the slack in business by providing for concentrated programs of public works.

# The Signal Corps' Job to Provide the Nerve System for the A. E. F.

## Fighting Forces Linked, and Communication with the Rear Maintained—127,750 Miles of Line Operated — Corps Proved Its Worth in Many Emergencies at Front and Frustrated the Enemy's Plans

*THIS article gives a modest but excellent summary of the work of the Signal Corps with the American Expeditionary Forces in France. It discloses not only the magnitude and importance of the tasks undertaken by this Corps, but many little known features of exceptional interest.*

*The work of the Signal Corps was directed and carried out very largely by American telephone and telegraph men, assisted by a group of experienced women telephone operators. To their ingenuity and daring, combined with ability to handle lines, circuits and instruments effectively, are due most of the electrical achievements of the Signal Corps, of which any American electrical man may well be proud. By permission of the Chief Signal Officer, A. E. F., this article is reproduced from "Stars and Stripes," the official organ of the A. E. F.*

FROM the days of the Greek torch bearer to wireless, the art of signaling has been perfecting itself until in this war its possibilities imposed upon the Signal Corps of the American Army the duty not only of keeping every part of the vast organization between front line trench and Washington in liaison but of discovering and reporting enemy movements as well.

An army without a Signal Corps would be like a man without a nervous system. It could not make a single co-ordinated movement. The great network of wires from company to battalion and from battalion to regimental headquarters, thence on to divisional, army and general headquarters, later interlaced with another great system of lines in the Services of Supply, and finally extending back more than 3000 miles to the Commander-in-Chief of the Army himself, is patterned curiously, both in function and action, after the nervous system of the human body.

Through this system of nerves the guiding brains of the Army received information and the resulting commands were sent out to the centers of action.

The Signal Corps of the A. E. F. was charged with two special fields of action—the construction, operation and maintenance of a general system of communication by telegraph, telephone and radio in the S. O. S., and communication by every practical means within and between fighting units.

The way in which the Signal Corps met these responsibilities can never be measured in dollars and cents, and yet it is interesting to know that a very conservative estimate places the money-earning power of that organization as a telephone and telegraph company alone during the war at $6,650,000, apportioned as follows: Telegrams, 8,685,960, $4,600,000; telephone calls, local, 25,184,500, $1,130,000; telephone calls, long distance, 870,148, $920,000.

The A. E. F. Signal Corps operated 202,500 kilometers (127,752 miles) of lines, of which 62,500 kilometers were combat lines maintained under the most dangerous and trying conditions at the front, and only 32,800 kilometers were lines leased from the French. Its telephone lines ran through 396 head central offices and 14,854 telephone stations, of which 123 central offices and 3064 telephone stations were at the front. It had 198 telegraph offices, 64 of which were with the advance armies.

There are times when figures, however large, seem to shrink before bigger things. For example, work of the Radio Section of the Signal Corps saved thousands of lives in the St. Mihiel drive. The location of enemy radio stations the night before the attack of Sept. 12, 1918, was the determining factor in the decision of the Intelligence Section that the Germans had not withdrawn from the region, despite almost overwhelming evidence to the contrary. At the time the sending of the infantry forward without artillery support was being seriously considered. Thanks to the alertness of our Signal Corps, even the enemy's plans for a counter-attack were caught by our intercept stations three hours before it was to have developed.

In a letter to the Chief Signal Officer of the A. E. F., dated Feb. 19, 1919, General Pershing said:

"Each army, corps and division has had its full quota of field signal battalions, which, in spite of serious losses in battle, accomplished their work, and it is not too much to say that without their faithful and brilliant efforts and the communications which they installed, operated and maintained, the successes of our armies would not have been achieved."

The Signal Corps was essentially a combat organization, with three-fourths of its troops serving at the front. At the time of the armistice there were 1000 officers and 27,000 members of its personnel on duty with the armies at the front, and only 462 officers and 6038 men in the S. O. S.

There should be mentioned in particular as augmenting this personnel 223 American women who came from from the States in six operating units. An Army report says: "It is only fair to state that the good service rendered under nerve-racking conditions during the last strenuous months of the war when the big push was on was due in no small part to the ability of the operators and their untiring zeal and labor in the service." And some of these "hello girls" got right up into the midst of it, too. A unit under Miss Grace Banker, as chief operator, handled the heavy telephone traffic of the First Army headquarters during two important operations—and handled it well.

### Signal Corps With the Armies.

The accomplishments of the Signal Corps in battle

and of that part of its personnel serving with the armies constitutes naturally the chapter of its work of which it is most proud. A field signal battalion of 14 officers and 459 men was attached to each army, army corps and division. Two telegraph battalions of ten officers and 212 men each were assigned for duty with each army and one with each corps.

The field signal battalions were composed of a headquarters and supply section, a radio company and a wire and outpost company. The telegraph battalions were provided with motorcycles, trailers and trucks and all implements and materials for constructing and repairing telephone and telegraph lines.

Signal work was, of course, very different for trench and open warfare. In the last days, when the armies swept forward miles at a time, the signal men swept forward with them, stringing their lines as they went, and maintaining communication with the bases principally by telephone. Radio was reverted to only when necessary.

In all our major advances our Signal Corps successfully maintained our lines, and an idea can be had of what this meant from the estimate of the French Army that it took 1000 kilometers of wire of all types for each kilometer of front consolidated after an advance of ten kilometers.

It was estimated by our own Signal Corps that an army of three corps advancing under average conditions should have a minimum automatic daily supply of 2500 miles of wire of all types, 500 lb. of tape, 800 dry batteries, an abundant supply of telephones, switchboards, telegraph instruments, radio equipment and quantities of special and technical supplies, in addition to the regular reserve to be carried.

In trench warfare, also, telephone and telegraph lines were principally used, the wires being laid underground in the regions near the front lines. The use of the telephone by our combat forces was so extensive that all other means of communication might be classed as auxiliary and emergency. By means of the "buzzerphone," telegraphic messages could be sent over the lines with practically no danger of interception by the enemy. Between company headquarters in the trench and battalion headquarters, underground telegraphy, or T. P. S., as the French called it, was used to supplement telephone communication. Then for the same purpose between battalion and regimental headquarters, trench radio was employed.

### Sometimes Ahead of Infantry.

The most interesting and spectacular modes of signaling in combat were employed only in emergencies. Generally, if the lines were cut, the Very pistol with its star shell cartridges or the 15-centimeter French projector could be used. Many times pigeons supplied the only means of communication, as in the case of the "Lost Battalion" in the Argonne. Runners, of course, played a large part in the relaying of messages after the fighting became continuously open last summer.

The Signal Corps men at the front, both in stationary trench warfare and in the open advances, did their work in the face of the same dangers and hardships that faced the doughboy, suffered heavily in losses, and gained richly in thrilling experiences worth while remembering. They went over the top with their comrades and oftentimes had to go ahead of the Infantry.

When the town of Vaux was captured June 30, 1918, because of a turning movement, a Signal Corps detachment reached the objective before the Infantry. A man was sent out to install a telephone. He found a likely looking dugout and went in, telephone in hand. He found nine Germans hurriedly packing up to move. He told them he wanted to put in a telephone. They objected and he insisted.

A fight ensued, and the lone American was decidedly underneath, when one of the German soldiers spoke in Polish. Once again the cosmopolitan character of the American Army saved the day. The telephone man was a native-born Pole himself, and in a few minutes he had reenforcements, with the result that shortly after he emerged from the dugout with a broken telephone and nine prisoners, five of whom were Poles.

### Intercepting and Copying German Messages.

There was one kind of work done by the Signal Corps at the front which for interest and daring vies with anything the records of the war hold. This was the task performed by 12 officers and 402 men of the Radio Section, who maintained six different kinds of stations for keeping tabs on the enemy and policing our own lines to see that the enemy did not keep any tabs on us.

They had intelligence intercept stations which copied messages in code from German ground radio stations; airplane intercept stations which intercepted messages between enemy planes and ground stations; airplane gonimetric stations which located enemy observation planes; control stations which supervised and policed the work of the American radio stations; goniometric stations which got bearings of enemy radio stations; and last but not least the listening stations which copied telephone and T. P. S. messages of the enemy.

The story of how the Germans devised a new code for use at the front and of how the Allies got on to it before the Germans themselves, illustrates the finesse of our Signal Corps in this kind of work. The new code was supposed to have gone into effect March 11, 1918. On March 13 an American intelligence intercept station caught a message from a German station which had just received a message in the new code, asking that the message be repeated in the old.

From the call letters given in the message it was possible to find both the original message in the new code and the repetition in the old. This assured the solution of the new code before the Germans themselves were familiar with it.

As a contrast, and as a curious commentary on the much-talked-of German efficiency and American unpreparedness, when a code book was stolen from us by the Germans, not only was another code ready but our operators were actually prepared to use it when the order went out to put it in immediate effect.

### Inductive Listening Stations and Their Hazards.

There is no more thrilling page in the romance of the war than the little known history of the American listening stations of the Signal Corps. They were always to the front and sometimes in No Man's Land itself, but wherever they might chance to be located, they were, as one of the men described them, "very near Heaven." Their business was eavesdropping, and if they didn't hear any good of themselves, they managed to do the doughboy lots of good.

Loops of wire were constructed out in No Man's Land parallel to the enemy's lines, and the tiny electric currents induced in them were magnified by means of an amplifier. Copper mesh mats or metallic rods were buried as near the enemy wires as possible and from them wires led to the amplifier. By this means

ground currents and leaks from the enemy wires were magnified to audibility.

The planting of these "grounds" near the enemy's lines called out some of the most heroic instances of personal bravery and resourcefulness at the front. Time after time these men were caught by the spotlight of a star shell as they crawled out in the night toward the German lines and were seen no more. Often they were caught between a double barrage probably started by their own sentry. More often, however, they wiggled their way through barbed wire and shell holes, planted their wires, and returned to reap the benefit of their daring.

### Special Service Sections of Signal Corps.

There were many special services of the Signal Corps charged with important and interesting work. For many years to come thousands of pictures of battle scenes and A. E. F. projects will never be looked at without a little reminder at the foot of them that they were the work of the Signal Corps. The Photographic Service in the 11 months to the armistice exposed in the field and developed 388,149 ft. of actual war moving-picture film, and at the same time exposed 24,273 still negatives from which 163,213 prints were made.

The Meteorological Section furnished data to the Artillery, Air Service, Chemical Warfare Service and Sound Ranging units as to the direction and speed of the winds and probabilities regarding rain, fog, clouds, etc.

The Army Pigeon Company rendered valuable aid in providing communication, especially with tanks and isolated units, when all other means had failed.

The Research and Inspection Division maintained at Paris a laboratory for the development of apparatus to meet signaling requirements, tested out all new apparatus and inspected all signal supplies. Among the new devices credited to this division might be named a tank radio set, the two-way radio loop set for communication between advanced units, the American listening station equipment, the two-way T. P. S. set, mobile telephone and telegraph offices, a gun-sight lighting device; radio tractors and trailers and gonio tractors.

An Engineering Section planned all Signal Corps installation. Finally, there was a section charged with the preparation of our codes.

### Largest Military Telephone and Telegraph.

The Signal Corps in the S. O. S. stood staunchly behind its front-line work. It not only made it possible for any American unit in the S. O. S. to get in touch with any other, but supplied all the missing links between the S. O. S. and the actual advance areas. It operated at Tours the largest military telephone and telegraph office in the world and two others nearly as large at Paris and Chaumont. The Tours office did more business than any commercial office in France except one in Paris alone.

In the fall of 1917 the increasing importance of A. E. F. activities in England made it necessary to arrange for our own cable across the English channel. Accordingly, in January, 1918, a four-conductor cable was laid for the Signal Corps between Le Havre and the southern coast of England, which connected directly with London. The Signal Corps established large offices in London and lines were leased to the various camps and ports in England occupied by the A. E. F., such as Winchester, Southampton and Liverpool.

To the credit of the Signal Corps must be given one of the chief accomplishments of the whole Signal Corps during the war—the successful equipment of combat divisions with the special signaling apparatus required in modern warfare. Much of this, especially radio equipment, was new to America and had to be located in sufficient quantity in Europe. Up to the time of the armistice the Signal Corps bought in France $9,500,000 worth of equipment for its combat units, and another $1,500,000 worth of line construction material. Miscellaneous equipment for photography, research, meteorological work, schools and repair shops, to the value of $2,500,000 was also purchased in France. Of course, not all of this was paid for in cold cash, but by Nov. 11, 1918, the Signal Corps had paid up bills to the amount of $4,500,000.

The Signal Corps maintained seven supply depots and three army parks covering storage of 350,000 sq. ft. and an open storage space of 1,500,000 sq. ft. More than 100,000 tons of supplies were handled, 62,000 coming from the States, 37,000 from France and 1000 from Great Britain.

And the work of the Signal Corps, with the troops and in the S. O. S., like the work of many other branches of the Army, has not ended with the armistice. Indeed, the accomplishments of this department in extending and maintaining communications hundreds of miles into Germany and to Rotterdam and Antwerp and of keeping the great scattering family of the A. E. F. on speaking terms would make a good story all by itself.

## DAYTON CENTRAL STATION WELCOMES FORMER EMPLOYES.

**Reception and Entertainment Given in Honor of Returned Soldiers and Sailors.**

The employes of the Dayton Power & Light Co., Dayton, Ohio, who have returned from military service were given a rousing reception at the company's recreation hall on May 13 by more than 300 of their fellow employes. On this occasion several entertainment features were provided and interesting talks were delivered by Lieut. Howard Tansey, Junior Lieut. Wm. Shuler and Lieut. Frank Kendig. A buffet lunch was also served.

The spirit of the occasion was very well expressed by one of the boys: "The best part of the going is the welcome extended on the return home, not only by the glad hand of friendship but by the old position being open for all employes of the Dayton Power & Light Co. that took part in the world war."

The committee in charge of the affair consisted of R. R. Herkins, B. C. Taylor, Frank Jones, F. F. Gunzleman, W. L. Andrews and C. P. Gorman.

## PROGRESS ON C., M. & ST. P. RAILWAY ELECTRIFICATION.

The electrification of the Chicago, Milwaukee & St. Paul Railway between Othello and Puget Sound cities, in Washington, is steadily progressing but may not be completed until late in September. However, an electric helper locomotive is expected to be put on over one section of heavy grade about July 1. Some delay in delivery of material and equipment and other hindrances have retarded the work during the last three months, but construction and installations are expected to be rapid from now until the entire project is completed.

# Circuit of the Current Transformer

## Current Transformer Characteristics—Its Function and Precautions to Safeguard It and Its Performance—Connections and Arrangements

By FRANCIS J. GILLOOLY

THE current, or series, transformer differs both in principle and in design from the shunt-connected transformer. Aside from the necessity for accurate meter registration of the power consumption of the circuit on which it is connected, the current transformer is given a position of first rank in importance by reason of its location in the circuit and the fact that it must furnish protection to the entire circuit and to the system from which that circuit feeds. In the event of a condition necessitating the immediate opening of the circuit, the importance of the current transformer could only be exceeded by that of the circuit-breaker which it is frequently called upon to operate.

The current transformer has no fuses to protect it. Its position as a path of the main circuit requires it to carry all of the energy flowing in the circuit, including the overload or short-circuit current as well as any resulting voltage surges. Its design must be such mechanically and electrically as to enable it to remain in the circuit and withstand the strains imposed on it until such time as it has caused the circuit-breaker to function.

It differs in principle from the shunt transformer in that its extremely small exciting current is always limited by the current in the secondary winding; its secondary voltage bears no relation to its primary voltage but varies with its secondary current, and amounts to only that value required to force the current through the complete secondary circuit; its secondary current is always in direct ratio to the primary current—the function for which the transformer was designed. It is rated for a maximum primary current-carrying capacity, a definite secondary current at full load primary current that establishes the ratio of transformation, and a secondary volt-ampere capacity at full load.

The current transformer is intended to be operated with its secondary always closed, as near to short-circuited as possible. The primary winding, connected in series with the line, must carry all the current flowing in the circuit. The current in the primary sets up a magnetism in the core that induces a current in the secondary winding. The induced secondary current sets up a magnetism that opposes that produced by the primary. Thus total core flux is limited to only that value that will induce an e.m.f. in the secondary winding sufficient to force current through the complete secondary circuit. The currents in the primary and secondary windings should be in inverse proportion to the number of turns in each. The magnetizing current must be negligible—in the modern transformer it is not more than 1% of the total primary current. The iron losses must be kept low, which means that the secondary must be almost short-circuited.

The greater the resistance of the secondary circuit, the larger will be the flux required to induce the necessary e.m.f., and the greater will be the magnetizing and iron losses. When the secondary impedance becomes so great that the core approaches saturation, the exciting current is so increased as to produce a secondary current out of proportion to the primary current and unlike it in wave shape and phase angle. The primary current is unaffected by the secondary load or by the transformer characteristics. The cross-section of the core is large enough to allow the iron to be worked at a low magnetic density—about one-tenth the density at which the shunt transformer core is worked.

The ratio of transformation would be the inverse ratio of the number of turns on the two windings were

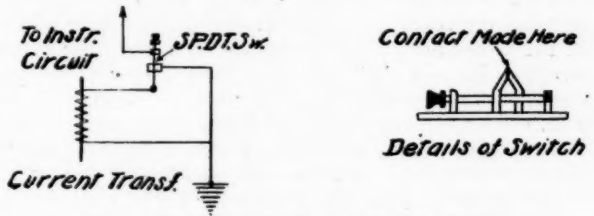



Fig. 1.—Transformer Short-circuiting Switch.

it not for the extra turns added to the primary winding to compensate for losses, and the ratio error caused by impedance in the secondary circuit. No current transformer gives a constant ratio from no load to full load, due to this variation in secondary impedance; and the ratio error is less the nearer to full load on the transformer. Compensation may be made for any loading point on the transformer. Frequently it is made at the 65% load point, when, by installing a transformer of 50% excess in capacity, the minimum of ratio error is obtained near full load, though the light-load-errors are correspondingly increased.

Changes in impedance of the secondary circuit are caused by changing the position of trip coil plungers, by changing meters on the circuit, as well as those changes caused by increase or decrease of current in the meters. With a given primary current, increasing the secondary impedance decreases the secondary current. The ratio curve of any transformer is good only for the secondary circuit for which it was taken.

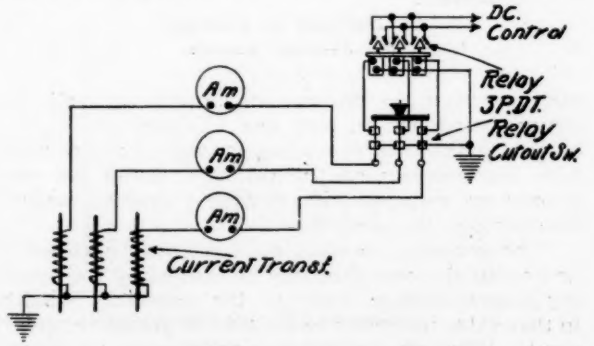



Fig. 2.—Relay Cutout Switch.

If the instruments must be changed about on the current transformer circuit, a ratio curve should be obtained for each combination, to furnish the correction factors to be applied to their readings—should absolute values be essential. Ammeters of the same type vary in impedance in inverse proportion to the square of their capacities. The impedance of watthour meter series coils is much lower than that of ammeters of the same size, so that with them ratio errors are slight. As the impedance of the secondary circuit may be changed by changing the position of the trip coil plunger, watthour meters are seldom placed on the same circuit with them; rather, the watthour meter usually has its own set of current transformers.

Accurate power registration will not be obtained where there is error in transformation ratio or in phase angle; the meters are calibrated for definite current and potential transformer ratios, and the phase angle determines the power-factor of the load at the meter. Increasing the resistance of the secondary circuit of the current transformer increases the phase angle between primary and secondary currents, but affects only slightly the ratio error. Increasing the reactance of the secondary has little effect on the phase angle, but appreciably enlarges the ratio error. The range of ratio variation is the range of variation in permeability of the core. If instead of iron, the transformer had a constant core, such as air, there would be no variation in ratio. Changes in frequency within 10% produce only slight error. Neither a current nor a potential transformer will give a correct inverted ratio, because the extra turns made for compensation are on only one winding. A 20 to 1 current transformer reading 5 amperes secondary with 100 amperes on the primary, would not read exactly 100 amperes primary were 5 amperes made to flow through the secondary.

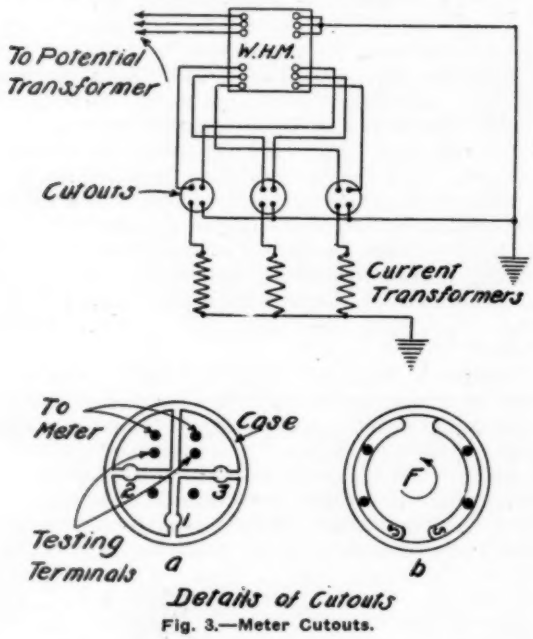


Fig. 3.—Meter Cutouts.

The secondary circuit must always be closed in order that the core flux may be limited by the opposing magnetomotive force of the secondary winding to that value necessary to induce the proper secondary e.m.f. When the secondary circuit opens, no current flows through it, there is no back magnetic force to limit that of the primary winding, and the entire primary current becomes exciting current. The excessive flux resulting not only causes an abnormal rise in secondary voltage, but might overheat the iron and burn out the transformer. Further, besides being greatly increased, the secondary voltage has its wave form changed, and its peak value may become enormous.

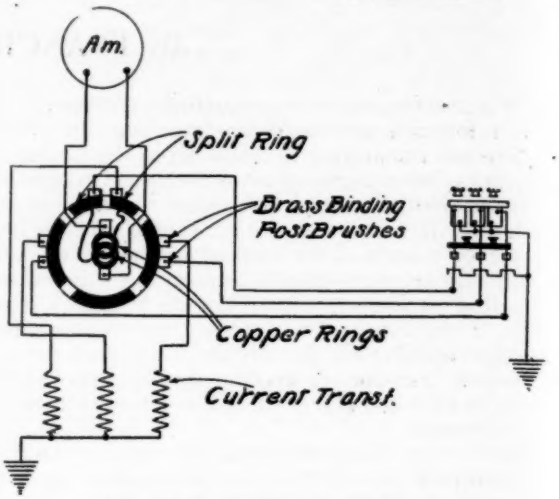


Fig. 4.—Three-Phase Ammeter Jack.

Various protective cutout devices are installed in the secondary circuit that isolate the meter circuit from the transformer while work is being done on it. One new station has a single-pole, double-throw knife switch of the short-circuiting type, similar to the field-discharge-resistance type of switch, installed on the compartment wall for each current transformer; connected as shown in Fig. 1. The switch makes its second contact before the first contact is broken; separating the current transformer from the entire secondary circuit, and short-circuiting it through ground. All of the cutouts used in the current transformer circuit operate on some modification of this principle.

Fig. 2 shows a three-pole switch of this same type used as a relay cutout. Opening the switch isolates the relay and permits connecting to testing instruments to calibrate its setting, without opening the circuit. On complicated transmission systems where close selective relay action is essential to service, a ratio curve for the transformer should be taken to supply any correction factors necessary to obtain a fine point of operation on the circuit-breaker.

Two types of watthour meter cutouts are shown in Fig. 3. The connections are the same with both: the current transformer lead is connected to ground and the meter circuit isolated. The device shown at (a) consists of four copper plates, with three holes between them for inserting plugs to complete certain circuits. With plug 1 alone in place, the current transformer lead is grounded and the meter circuit open. Binding posts for the meter testing instrument are shown on the two upper segments. In the cutout shown at (b), a hard rubber disc carrying the copper strips S S makes a wiping contact under the binding posts. One strip is shorter than the other, so that when the disc is turned to that position the strip does not touch the two meter binding posts, and this circuit is left open for the testing apparatus.

In the newest central station construction, only

one ammeter is installed on many polyphase circuits, each of which is provided instead with a type of phase-selector switch known as an ammeter jack. This device is shown in Fig. 4. It consists essentially of four copper segments and two copper rings mounted on an insulated shaft, and which are revolved under square brass brushes that serve also as binding posts for the leads. The ammeter rings are fed from the halves of a split segment, through which the ammeter and relay are connected in series to one current transformer, while the relay is connected direct to the other two current transformers. The relay is always in circuit, and no circuit is open at any time. Unlike the potential transformer, neither the primary nor the secondary of the current transformer is ever fused. The ammeter should be placed on the transformer that carries the trip coils or relay, so that an opening of this circuit could be at once apprehended by the zero reading of the meter.

The primary function of the current transformer is to furnish the initial operating energy for the circuit-breaker trip system in the event of overload or trouble. Additional uses for it are to supply the current for ammeters, watt or watthour meters, power-factor meters, and the line-drop or other compensators or the current coils of various voltage-regulating devices. One of the big central stations having a diversified and interconnected system of generating units is now installing separate current transformers on each piece of apparatus entailed, all transformers to be connected to a common set of meters, because of the value placed on a knowledge of their maximum instantaneous output.

Current transformers should be installed on all circuits of over 1000 volts or where the primary current is more than 5 amperes. The transformer should be capable of withstanding 150% rated load continuously, and its insulation should at least be for 2000 volts more than 2¼ times normal voltage—practically

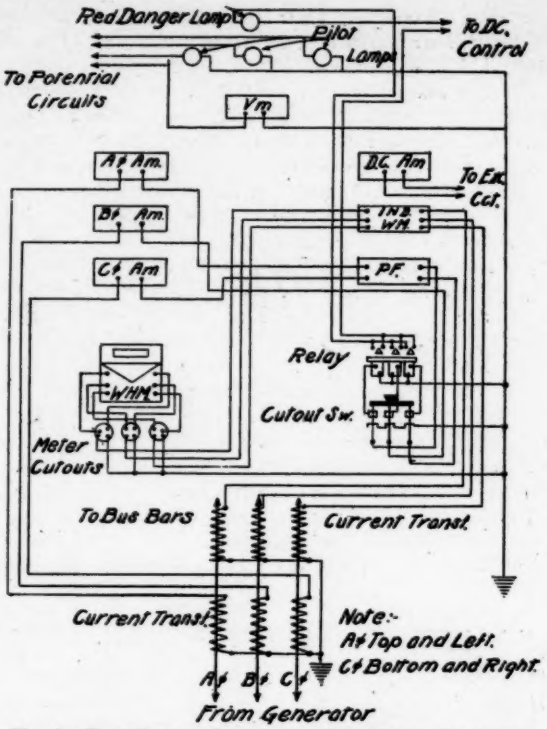
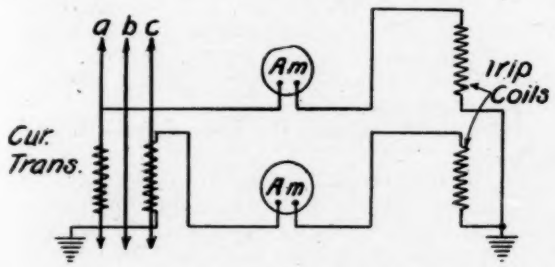


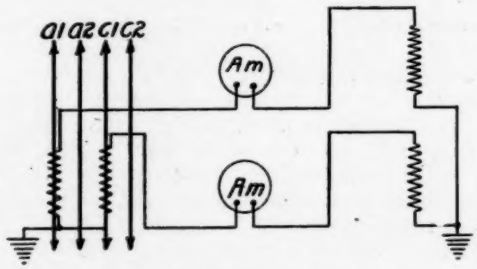

Fig. 6.—Transformer Connections for Modern Generator Switchboard Panel.

3 times the voltage on which it must operate. The secondary capacities of current transformers vary from 10 volt-amperes for a 2500-volt transformer, to 50 or 60 volt-amperes for a 15,000-volt unit.

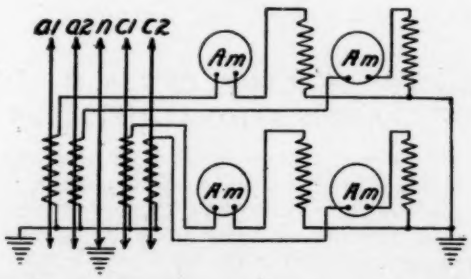
Fig. 5 shows some correct trip coil connections. In a balanced two-phase, three-wire system, such as shown at (a), the current in the "A" and "C" wires is the same and the current in the "B" wire is 1.41



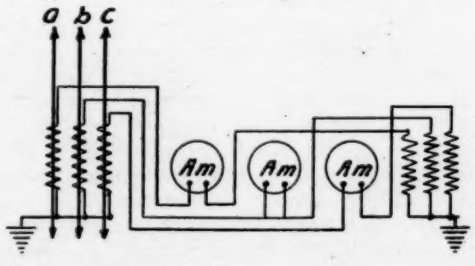

Two-Phase Three-Wire
a




Two-Phase Four-Wire
b




Two-Phase Five-Wire Grounded Neutral
c




Three-Phase Three-Wire
d

Fig. 5.—Connections of Current Transformers for Trip Coils or Relays.

times that of either. Two trip coils, one in each outside wire, furnish sufficient protection for such a system. The connections for a four-wire, two-phase system are shown at (b), and for a grounded-neutral, two-phase system at (c). Much calculation to obtain equivalent current values in primary and secondary circuits is involved when only two current transformers are used on a three-phase, three-wire, ungrounded-neutral system; with the neutral grounded, three transformers are imperative.

In Fig. 6 are shown the current transformer circuits of a central-station three-phase generator panel. There are two circuits. The current transformers nearest the generator carry the ammeters, the power-factor meter and the relay. The other set of transformers carries the indicating wattmeter and the watt-hour meter. The potential transformer connections to these meters are not shown. Each panel has its own instrument ground bus. The secondaries of both current and potential transformers are grounded. The voltmeter can be connected to any phase through an instrument phase-selector switch, through which synchronizing may also be done on more than one phase.

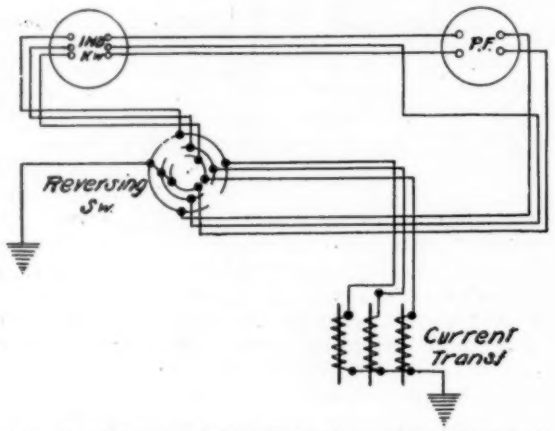



Fig. 7.—Connections of Three-Phase Current-Reversing Switch.

The power-factor meter current coils are connected only to the "A" and "C" phases, but the wattmeters have current from all three phases. The relay here does not trip the alternator circuit-breaker; it merely lights the red danger light; sometimes a bell alarm also is operated from it and may be connected for overload, reverse-current, or both.

Frequency changers, transmission tie-lines or other apparatus in which the direction of flow of energy may be reversed, must have either double-scale meters or some type of meter reversing-switch. Frequently the potential connections are reversed through a simple double-throw knife switch since there is no restriction against opening the potential circuit. Fig. 7 shows a three-pole, two-way current reversing-switch, resembling the ammeter jack in design. Two sets of copper rings on an insulated shaft are revolved under stationary contact, and the reversal is effected by feeding the current into different ends of the circuit.

In ordinary operation the meters are never changed about on the switchboard, and the degree of accuracy obtained from the current transformer is high enough for ordinary metering and protection purposes. In laboratory work where fine values are necessary and where different instruments are used on the same current transformer, correction factors for ratio and phase angle must be obtained, and as these values hold good only for the circuits on which they were obtained, the tests must be made for each combination of connections. The tests made are those to determine the phase angle between primary and secondary currents and the ratio error, and a curve is plotted showing these variations from no load to full load on the transformer.

## USE OF AUDIBLE ELECTRIC SIGNALS IN INDUSTRIAL PLANTS.

**Extract from Paper Recently Presented by Prof. V. Karapetoff Before the Rochester, N. Y., and Erie, Pa., Sections, A. I. E. E.**

No industrial plant of any magnitude may be considered fully efficient unless means are provided for promptly locating any important employee, no matter where he may be within the plant. A private telephone system, however extensive, serves this purpose efficiently only as long as the needed man is at his desk. On the other hand a superintendent, foreman, millright, repair man, etc., is ordinarily useful only insofar as he can freely move about the shop without the fear that someone of importance may need him. Thus, within the last few years audible electric signals have been introduced into many industrial plants.

Such an electric signal is usually similar in construction to the electric horn used on automobiles. It consists of a diaphragm with an anvil at its center. A toothed wheel driven by a small electric motor strikes the anvil many times a second and causes it to vibrate vigorously which produces the well-known warning tone. Such motor-driven signals are now made much more powerful than automobile horns, and are wound for 110 or 220 volts, direct or alternating current. With such electric audible signals scattered throughout the plant, it becomes an easy matter to locate instantly any person to whom a code number has been assigned.

As it would be rather inconvenient to sound various calls by hand a special code-calling automatic instrument has been developed for this purpose. The operator merely sets the desired person's code number on a dial and pulls a lever, a contact-making mechanism is thereby set in motion, which closes the electric circuit and operates the code signals throughout the plant.

A further application of loud electric horns in industrial plants is for extensions to telephone bells. In this case, a relay is connected in parallel with or in place of the telephone ringer, and when it is actuated, it closes a secondary circuit which causes an electric horn to sound. Audible electric signal systems are also used in various plants as warning signals on cranes and hoists, also to call a shifting locomotive, to indicate the beginning or end of a certain operation, and for other local purposes.

## NEW YORK SECTION OF A. S. M. E. ENTERTAINS NATIONAL OFFICERS.

The New York Section of the American Society of Mechanical Engineers gave a luncheon to the national officers and directors of the society at the Engineering Societies Building on May 16. About 100 members attended the luncheon, which was arranged to provide an opportunity for the local members to meet the national officers and directors. Mortimer E. Cooley, president of the society, addressed the meeting. Twenty other officers and directors were present.

## RULES FOR GROUNDING DISCUSSED BY INSPECTORS.

**Meeting of Western New England Section, National Association of Electrical Inspectors—Association News.**

Revival of normal interest in peace-time inspection problems by members of the National Association of Electrical Inspectors was seriously retarded by the great deal of attention to inspection of war plants and other war services that the members were called upon to render. The association has, however, gotten back to practically a peace footing, the sections are again meeting or planning to meet, and every effort is being made to hold a very successful general reconstruction convention next October at Springfield, Mass.

The following report of the meeting of the Western New England Section has been furnished to the ELECTRICAL REVIEW as the official organ of the National Association of Electrical Inspectors.

### MEETING OF WESTERN NEW ENGLAND SECTION.

At the recent spring meeting of the Western New England Section the members were entertained at dinner by the wife and daughters of Past-National-President Thomas H. Day, in his home in Hartford.

During the meeting, which extended throughout the day and at which Section President Lewis N. Heebner presided, considerable time was spent in discussing the rules for grounding. The need of running two ground wires, one for the service, the other for the service conduit, seemed to present some economic hardships, especially when the service conduit entered the building at a considerable distance from the main cock of the water piping system.

A member of the Subcommittee on the Rules of Grounding was present and he explained a feature of the rule which many had lost sight of. He called attention to the fact that in some sections the overhead construction was on the dividing line of the property, thus bringing the service wires into the installation through the rear of the buildings, while the water piping systems entered the building through the front wall. Under such an installation condition, it was explained, it would be within the present wording of Rule 15-A to install a No. 6 wire from the service wire to be grounded to the water pipe ahead of the main cock and to install a No. 6 wire from the service conduit to the nearest water pipe and to "jumper" the water meter with a No. 6 wire also.

During this explanation the words "long run" in Section *q*, seemed to be a disturbing factor, there being an opportunity for a serious and honest difference of opinion between inspectors and other interests as to just what instituted a long run. At the section meeting the opinions among the members as to what is a long run varied from 10 to 50 ft.

The following suggestions for changes to Rule No. 15A were then considered and it was voted to forward them to the president of the National Association for further consideration.

Section *n*, fifth paragraph, add another sentence, as follows: "On systems having five or more services grounded to metallic water piping systems, the service conduit may be grounded to the ground conductor of the circuit wires."

Section *q*, first paragraph, change wording the first part of the first sentence to read as follows: "Ground connections for electrical circuits to metallic piping systems must be made on the street side of main cock. . . ."

Section *q*, second paragraph, change the wording of the first sentence, as follows: "Ground connections to a metallic piping system for equipment, wire raceways or service conduit may be made outside of main cock or other device at a point near the part to be protected, provided there are no insulated joints or fittings in the pipe to prevent a good ground."

The following committees for the reconstruction convention of the National Association of Electrical Inspectors, in Springfield, Mass., next October, were announced:

Banquet—A. E. Braddell, New York City; W. P. Briggs, New Bedford, Mass.; Thomas H. Day, Hartford, Conn.

Program and Speakers—Washington Devereux, Philadelphia; Hubert S. Wynkoop, New York City; Wm. Lincoln Smith, Concord, Mass.

Reception—W. S. Francis, Pittsfield, Mass.; L. N. Heebner, South Manchester, Conn.; P. O. Neumann, Holyoke, Mass.

Publicity—A. W. Hopkins, Springfield, Mass.; Henry S. Knight, Worcester, Mass.; Richard J. Forsyth, Greenfield, Mass.

Entertainment—Milton S. Nettleton, New Haven, Conn.; Joseph P. Rohan, Hartford, Conn.; Marshall H. Mahoney, Amherst, Mass.

Past-President Allen W. Hopkins, of Springfield, Mass., announced that one of the manufacturers of electrical supplies, in Springfield, had promised to send 500 pocket binders for the National Electrical Code, to those on the mailing list of the National Association, for the purpose of calling attention to the convention, which is to be held in the Mahogany Room of the Municipal Building in Springfield, Oct. 13 and 14.

An interesting letter to Mr. Day from the editor of "Q S T," a magazine devoted exclusively to matters concerning wireless telegraph apparatus, was read. The writer was an instructor, also a lieutenant, during the war. The subject which the letter opened was too much for the time of the spring meeting and the secretary, Richard J. Forsyth, was directed to invite Mr. Tuska to be the guest of the section at its summer meeting in South Manchester, Conn. The letter is worth reading. In slightly condensed form it is reproduced below.

### RULES AS TO INSTALLATION OF WIRELESS TELEGRAPH APPARATUS.

I am writing this letter to bring out some points about Fire Underwriters' regulations applying to wireless telegraph apparatus. To establish my points, it might be well if I were to state briefly some of the developments in aerial systems which have taken place during the war.

With the modern sensitive receiving apparatus, it is no longer necessary to have an outdoor antenna. It has been found that a few wires near the top of a house and indoors will receive signals with as much sensitiveness as the same wires a few inches higher and on the outside of the house. Experiments have also shown that combinations of indoor and outdoor aerials give satisfaction. That is, I might run several wires in the attic of my home and extend these wires through the walls of the house so that the antenna system was partly inside of the house and partly outside.

Probably the most startling development is that of the so-called *loop*. As an actual and practical illustration of the loop, I shall state the experiment which was performed by L. D. Fisk, of West Hartford, and myself. We made a loop consisting of 16 turns of No. 22 magnet wire in the form of a square whose diagonals were 10 ft. This loop was placed on the second floor of Mr. Fisk's home and was used in the place of the so-called outdoor antenna. A ground connection was made use of as in the usual case. However, a ground connection is not a necessity. With this loop, entirely within the house and, in fact, all of the apparatus and all of the connections within one room, we were able to receive read-

able signals from Lyons, France. This is not considered exceptional work. By means of amplifiers our range could have been extended without limit. It might be of interest to know that this same set will receive signals without any external connection of any sort, either ground or aerial.

I have stated these developments in order that I might bring out facts which were unavailable at the time of the writing of the latest edition of the National Electrical Code. There are other developments even more startling, but these have less bearing on the regulations of the National Board of Fire Underwriters.

I shall now state a rather hypothetical case of an aerial system which I might erect in my home. Let us suppose I have the usual antenna system in the back yard. I connect a lead-in to the antenna and on the third floor of the house and outside of the house I place a single-pole, double-throw switch of approved pattern connected with a No. 4 B. & S. gage copper wire to a satisfactory earth connection. This, as I understand the regulations, meets with entire approval. Now suppose the wire to my apparatus is connected from the remaining pole of the single-pole, double-throw switch and is run close to the roof from the rear of the house to the front and then down to the second or even first floor, where the receiving station is located. As the regulations stand, this construction is approved and it is a fact that I can ground the *aerial* and with the lead-in wire *inside* of my house, I can receive and transmit signals. Is it not true that this wire inside of the house under certain conditions may offer just as much of a hazard as regards lightning as the same lead-in wire just above the roof? Of course, under certain circumstances (for example, a tin roof between the wire and outdoors) it is conceivable that the lightning would be much more apt to strike the tin roof than go through the tin roof and strike the wire. On the other hand, it might be said that the lightning would strike the tin roof and jump from there to the wire.

In writing these suppositions, I cannot help but realize that I am assuming what lightning may do and I suppose the assumption is almost as dangerous as the lightning itself. However, the question which actually arises is: What constitutes aerial conductors as defined by the Electrical Code? The Code simply specifies aerial conductors, and as I read the same, it seems to presuppose that these *aerial conductors* are outside of the building. I make this statement with reference to Rule 86, Section *b*, which, in defining the method of grounding, says in effect that the aerial conductors must be cut off from apparatus *within* the building. The uncertainty is clearly brought out if I ask what steps I am to take to ground an *indoor aerial*. Should I run the lead-in outside of the house and then put the lightning switch on the outside and run the wire back into the house again, or is there anything in the regulations which would permit me to ground the aerial entirely within the house, and if this case is true, would not practical conditions seriously interfere with the use of a No. 6 B. & S. gage (copper) wire within the house?

Although many of the questions I have brought up are hypothetical, I am sure they are practical enough so that the regulations should fully provide for them. In my opinion, the indoor antennas under most conditions are equally hazardous with the outdoor. However, in the case of an indoor aerial, the main and only real need for grounding is to provide a satisfactory leak for heavy static or lightning. In my opinion, a ground wire should be required of such gage which is not less than the gage of the sum of the aerial wires connected in parallel. I believe this same regulation may apply to the outdoor aerial. I have always regarded that a chain is no stronger than its weakest link, and in case the outdoor aerial is composed of four No. 14's, I fail to see any advantage whatsoever in grounding with a wire larger than the equivalent of four No. 14's. Of course, I realize the question of reasonable mechanical strength and workmanlike installation, but at the same time I cannot help but feel that the present regulation requiring a No. 6 puts a heavy restriction against a possible future Marconi or Edison who only has enough money saved by hard work to purchase some simple wireless apparatus. I do not wish to be misunderstood. I am not objecting to the No. 6 wire on the ground of expense, but I am objecting to it because of true need. The ground wire, as far as I have been able to learn, is not a possible protection if the aerial is struck by lightning, but it is to prevent its being struck by virtue of the leakage of charges to the ground.

I should like to recommend:

(1) That aerial conductors be defined. A suggested definition follows: "Aerial conductors in wireless telegraph stations will be all conducting wires used for radiation or absorption of signals which are above the point of minimum potential and maximum current indication." This is an entirely technical definition, but is susceptible to practical application. I shall be pleased to personally explain the definition if necessary.

(2) A change in grounding regulations. A suggested regulation follows: "All aerial conductors to be permanently and effectively grounded at all times when the station is not in operation by a conductor not smaller than the sum of the gages of wires in parallel, run in as direct line as possible to a water pipe on the street side of all connections to said water pipe within the premises or to some other equally satisfactory earth connection. In such cases as indoor aerials the ground lead may be within the house. In the case of outdoor aerials, the ground lead shall be run, insofar as is possible, on the outside of the house. In the cases of combinations of indoor and outdoor antennas, the ground lead may be run inside of the house."

(3) Reference to the wireless ground of transmitting stations. Suggested regulation follows: "In the case of transmitting stations using a primary power of one-tenth kilowatt or more, the ground used for this transmission shall include the water pipe, gas pipes, sewer pipes and all other ground connections within the building, if a grounding system is used." (Note.—A counterpoise might be used instead of an earth connection.) The reason for this regulation is to avoid the sparking which may occur between grounds of different potentials. This has occurred in my own case when sparks were occurring between the gas and water pipes, when the gas pipe was not part of the wireless ground. It was avoided by connecting the gas pipe to the grounding system.

(4) Reference to the aerial systems in the case of transmitting stations. Suggested regulation follows: "When the aerial conductors of a wireless station are used for the transmission of signals, said conductors, insofar as is possible, must be at least 1 ft. from all other conductors in the neighborhood of the conducting wires."

These suggestions and recommendations are worded rather clumsily but will, I hope, provide a basis for discussion only. I am sure that the rapid growth of wireless during the war requires a similar growth or change in the regulations. Conditions exist at present which were unthought of when the regulations were drawn. A large number of stations will be erected throughout the country and I believe full regulations should be drawn to protect these stations against possible lightning damage and at the same time I believe it will be beneficial to the experimenters themselves if they are required to observe these regulations.

C. D. Tuska.

## THE TRAINING OF DISABLED MEN FOR ELECTRICAL WORK.

### Valuable Experience Gained at an English Center for the Vocational Training of Men Partly Incapacitated by the War.

The training of the disabled soldier or sailor from the electrical engineer's point of view was discussed by the Junior Institute of Engineers in London at a recent meeting. F. H. Taylor, a well-known British electrical and mechanical engineer introduced the subject. He said that probably a very much larger percentage of candidates applied for training in the special electrical branch than in other branches of engineering. This fact was partly, if not almost entirely, due to the impression prevailing in the minds of those who had to advise a man as to a trade to take up, that electrical engineering was a "light occupation" and one which did not therefore call for any great physical exertion on the part of the person trained. If the man selected electrical training on his own initiative and conviction he was more likely to be determined to successfully combat any difficulties likely to arise.

Mr. Taylor gave a list of men in a great variety of trades, including blacksmiths, butchers, bakers, hotel porters, valets, gardeners, clerks, and so forth, who wished to "take up" electrical engineering. At first it might be thought that such pre-war occupations hardly made these men very promising for training in such an occupation as electrical engineering, where an enormous amount of detail had to be properly mastered, and where the man should be expected to de-

velop into a thinker, as well as a manual worker. In many cases, however, the ability of the student to grasp and develop the information imparted to him has proved to be beyond all expectation. A valet, for example, after six months' electrical training produced results as good as anyone could possibly wish for. The man was well able to plot curves of experimental results and make ready calculations in alternating-current work or similar subjects requiring clear, sustained mental effort. An exactly similar result was obtained with a man whose pre-war occupation was that of a farm laborer; many records of similar results could readily be produced. Naturally, the nature and amount of the disablement was a factor in the case, but to nothing like the extent which might readily be supposed. A much more important factor was the care and method adopted in training. This training must be in every way systematic. Haphazard methods were utterly useless. The syllabus must be slowly, but surely, progressive and carried on step by step. The utility and practical application of each section of the course of training should be made obvoius to the student, so that his sympathy might be aroused and sustained. Whilst the practical side of the man's training must be a strong point, the theoretical side could not be neglected, if a type of worker better than in the past was to be produced. In the United Kingdom approximately 24,000 men have been or are under training by the State, in various subjects. Approximately 3550 of these have been or are being trained in various branches of engineering. In electrical engineering the number of men in training, or completed training, is about 882. Training is being carried out at 45 centers, these being polytechnics or technical institutes and, in a few cases, the works of manufacturing electrical engineers. The training centers are well distributed over the whole of Great Britain. The disabled man does not necessarily become trained in his own home area, as it is frequently necessary to transfer him to some other locality where the particular trade he requires is specially taught. In many cases he enters for his course within a few days of leaving the hospital. It is most desirable that waiting for training should not occur. Hospital treatment during training may be a matter of some seriousness from the instructor's point of view, but in many cases it is found to be a matter of small consequence from the educational standpoint.

Sometimes the mere training itself has had the beneficial effect of treatment, both health and mental condition being enormously improved. In many cases training has unexpectedly proved to be an excellent means of diminishing disablement. In cases of gunshot wound in the hand, men have been quite unable to grasp even a tool of fairly good size, but when they have been set to work amongst others not so disabled and left to follow instructions as well as ability would permit, they have gradually become quite well able to grasp small articles, such as a pipe of 5/8-in. diameter. Continued gentle exercise of affected limbs and parts under the conditions prevailing at a training center gradually diminishes many a disablement. That this often unlooked for point is of immense value can easily be realized.

In regard to the measure of disadvantage under which a disabled man stands electrically, Mr. Taylor instanced cases of men with an artificial leg or foot who showed no hesitation and very little loss of speed in climbing a ladder or in walking to the extent which a man in the electrical trade was commonly required to do. Also of one-armed men bending, cutting and screwing conduit quite as well as any other man; and of a man with amputation of two fingers and thumb on the left hand, and thumb on the right hand, who holds tools quite comfortably and who is quite competent to make ordinary spliced joints in small cables and in a reasonable time. A man whose right arm was amputated at the shoulder made a very good free-hand drawing unaided and without using an artificial limb.

The branches of the electrical industry in which training is being given at the various British centers are: Electrical fitting; installation; maintenance and repair work; substation and switchboard attendants; country houseplant attendants; armature winders; meter repairing; dynamo and motor construction; instrument making, testing and calibrating; switch and control gear manufacture; telegraphy and telephony. Mr. Taylor's experience was derived chiefly at the Croydon Training Center where specialization has been made in electrical installation, maintenance and repair work. About 62 men are now in attendance.

The training provided is as follows: (a) A lecture course covering elementary electrical engineering, supplemented by experimental laboratory work and experience in handling and running generators, motors and switchboard equipment; (b) a specialized course on installation, maintenance and repair work, practically all the men enrolled being suitable for and taking up work under this branch of the electrical industry. In order that instruction may be as complete as possible under section (b) a well-fitted workshop has been established adjacent to the main building, where every experience can be given to the men, in the manifold details with which installation work is so replete. Each man does 30 hours per week, the mornings being spent chiefly in lecture work, and the afternoons in laboratory and workshop practice. In the last two months of the course workshop practice may be extended to all day and every day instead of only five. This is a "hardening" process accustoming the man to the physical exertion of long periods of standing at work. In the workshop each man is required to enter up, day by day, a note as to the work he has accomplished and the results obtained, for initialling by the instructor in charge. The men are as keen on this arrangement as are those responsible for their progress.

## FREAKISH BEHAVIOR OF COMPASSES DURING MILITARY ENGAGEMENT.

**Lynn Section, A. I. E. E., Hears Experiences of 105th Infantry Regiment in France.**

On May 28, Col. James M. Andrews lectured in General Electric Hall, West Lynn, Mass., on "Random Remarks, 105th Infantry in France." Arriving in France on May 30, 1918, in command of 3855 men, Colonel Andrews found the Allies war-weary and pessimistic. For seven months his regiment was in the thick of the fray and when the armistice was signed but 287 men were left in fighting trim.

In the experience of his regiment the greatest reliance had to be placed on machine gun, grenade and bayonet. Twice in a dense fog when the compass was most needed the action of these instruments was erratic, and at the critical moment they were untrustworthy. The speaker has been seeking an explanation of this unfortunate phenomenon so far without result. Whether caused by mechanical or physical disturbance, or by the magnetic effect of so much flying steel is yet a problem unsolved.

# Editorial Comment

## Motor Sizes and Power-Factor

ONE of the chief causes of low power-factor is that lightly-loaded induction motors are used, and that motors too big for the job are installed. The desire on the part of the industrial plant management to "play safe" or have ample motor capacity for future needs is one reason for over-motorization. Other reasons may often be that the motor salesman is carried away by the optimism of the prospective motor purchaser; he is influenced by the motor sizes most readily delivered, or the commissions on sales.

Whatever the reason or reasons may be, the fact remains that in too many cases industrial plants are over-motored, and low power-factor results. Much can be done to improve matters by education, and it is the central stations that are best able and have most to gain by such education. A power-factor clause in the power rates, or even a rate based upon kilowatt-hours and connected load, would do still more to bring up the power-factor by more careful choice of motor size and by encouraging the use of the synchronous motor.

## Knowledge of Rate-Case Terms

IN the formal proceedings before public service commissions it has come to be common practice to adopt a close approach to regular court procedure with the practices and privileges long accorded to the legal profession. Among these is the common custom among counsel to heckle the opposing witnesses on cross-examination and to take special delight when it can be shown that they do not know what they are talking about. Therefore, before passing through the ordeal of appearing in the witness chair it is well for the witness to be sure not only of the facts in his testimony but also of the language he employs.

Rate cases have become common only in the last dozen years and there are a great many utility managers that have not familiarized themselves with the terms frequently used in their procedure, conseqnently if called on to testify they are likely to injure their cause by wrong usage of a term. The commonly accepted definitions of such terms are therefore worthy of study and for this reason the article by Mr. C. W. McKay in this issue should prove of value. It is the second article of a series of twelve that Mr. McKay is preparing, all of which are intended to help the utility manager or official who may be called on to take some part in the conduct of rate and valuation matters which he must do intelligently if he does not want to injure rather than help his cause.

## Broadening the N. E. L. A. Organization

IMPORTANT changes in the administrative organization of the National Electric Light Association have been necessitated as announced on other pages of this issue. The need for these has arisen from the desire to broaden the influence and activities of the association at the same time that the remoteness from New York headquarters of President R. H. Ballard's residence and the serious illness of Secretary T. C. Martin require a decentralization of former executive responsibility. By the new administrative plan the four vice-presidents will be called on to relieve the president of many executive burdens and to direct the work of the four working divisions of the association. It is expected that the work of the geographical sections and the company sections will also be stimulated through this change of executive organization.

In making these changes the National Electric Light Association is following the practice found necessary by many large commercial and industrial organizations and corporations as well as by the executive branches of our governments. The responsibilities centered in the president of a huge organization are too numerous and important to be shouldered by one individual unless he can devote himself exclusively to them. While decentralization has disadvantages, it is a necessary part of modern administration of large organizations. The work of the entire organization should be accelerated through its more intimate contact with one of the ranking executive officers.

## Revise Radio Installation Rules

GREAT progress was made during the war in the development of radiotelegraphy and radiotelephony. Among the advances was the entire change in practice with regard to antennas or aerials. The elaborate and high tower or roof structures are no longer necessary and in fact, the antenna does not even have to be outdoors. Obviously, the rules for installation of the antenna may require quite radical revision. This matter has been called to attention in a letter presented before the recent meeting of the Western New England Section of the National Association of Electrical Inspectors. (See page 947.)

The letter shows forcibly the need for revision of the National Electrical Code rules relating to radio work. This is but another illustration of the possibilities for more prompt and thorough consideration of proposed changes in the Code that can now be given through the new technical subcommittees of the Electrical Committee entrusted with keeping it up to date.

## *Reducing Turbogenerator Combustibility*

ATTENTION has already been called in these columns to the fact that turbogenerators may catch fire, and when once afire it may be difficult to quench the conflagration. In any case these fires mean a machine out of service and a probably heavy expense.

While it has been recognized that turbogenerator fires have been occurring, the impression is abroad that these fires are few and far between. Turbogenerator operators have felt, therefore, that they are only indirectly interested, because the possibility that their machines might catch fire and be damaged or destroyed seemed rather remote. But in view of facts as they are such a feeling of security hardly appears warranted. In the last three to three and one-half years, thirty companies reporting show that eighty-one internal turbogenerator fires have occurred. As these reports are not necessarily complete it can be realized that the subject of fires in turbogenerators is a matter of importance to the central-station industry, the more so as the individual capacity of these machines increases, and greater dependence is placed upon individual units.

In considering the possibilities and probabilities of internal fires in turbogenerators, it might appear needless to state such a truism as that prevention is better than cure, since it is so obvious that it is better to prevent a fire occurring than to put it out quickly once it has occurred. As fires may start from any one of a number of reasons, preventing fires becomes a matter involving many factors. However, certain fundamentals, if borne in mind and acted upon, will tend to prevent fires, and limit their extensiveness and destructiveness. A generator passes its own weight of air in an hour, hence it is not difficult to understand that if only a small amount of dust and oil is carried over and deposited upon a machine, the quantity assumes the aspect of a fire hazard in course of time. Lint from station wipers and similar materials offer food for combustion caused by arcs and sparks as they accumulate in course of time.

Keeping the in-going air clean, and preventing extraneous materials from finding lodgment in and around the generator windings, appear to be two of the first precautionary measures toward preventing and reducing internal turbogenerator fires. Fire-fighting methods dealing with the effect and not the cause can come later. Air-conditioning apparatus is deserving of careful consideration as a method of reducing the possibility of fires, even in localities where the air is considered as clean. And it is surprising how much foreign matter is carried even in so-called clean air. That air conditioning increases generator capacity and tends to longevity by reducing operating temperatures are other tangible reasons that should carry part of the investment charges of the apparatus necessarily involved.

## *Starving Out the Unreliable Contractor*

DESPITE the numerous attempts which have been made to eliminate the so-called "curbstoner" or unreliable electrical contractor by the legitimate contractors and the industry as a whole, he is still with us and apparently as strong as ever. True, in those localities which have adopted rigid license laws for electrical contractors his activities have been limited to a great extent, but even in these places he is still a problem.

One of the principal reasons for the ineffectiveness of the license laws in this respect is that such people (they cannot be called contractors) do not want inspection and naturally pay no attention to the license rules, limiting their activities in such a way that they are not easily caught. But their work under such conditions is even more treacherous than when it is unlimited. Of course, they do not attempt complete installation; if they do they bring ruin upon themselves in a very short time. They are content to survive upon the changes or additions to existing installations where their inferior work cannot be easily detected. Work of this nature not only is hazardous in itself but jeopardizes the original work, and very often the reliable contractor is blamed for an installation which was ruined by the curbstoner.

Frequent reinspection is usually considered the best means of remedying this condition, but even this has its drawbacks. To be really effective it must be very frequent and therefore expensive and, in addition, tends to create a doubt in the mind of the consumer as to the safety of the entire electrical installation, especially when he is put to the expense of changing the work done by the curbstoner.

A more effective method and one which should prove more profitable to the legitimate contractor is to starve out the curbstoner by reducing his opportunities. As has been stated, his activities are now confined principally to installing, in his well-known hazardous and unapproved fashion, additions and changes to existing installations. His greatest opportunity along these lines is the installation of outlets to permit the use of the various electrical appliances. Without such work he could not exist except in a very small way and eventually could be eliminated. For this reason every installation which does not contain an adequate number of such outlets may be considered as adding to the curbstoner's opportunities.

It follows, therefore, that a real effort on the part of all contractors to have these outlets included in the original installation will do a great deal towards eliminating this undesirable element. And the time to start this effort is now, when building activities are rapidly increasing. Numerous outlet campaigns recently conducted have greatly reduced the opportunities along these lines in the older installations and if the present and future work is made adequate when put in the curbstoner will cease to be a problem.

## *Supreme Court Upholds Federal Control of Utility War Rates*

COMPLETE control by the Federal Government over all railroad, telephone and telegraph rates, interstate and intrastate, under the war powers conferred by Congress, was upheld by the United States Supreme Court in its decision rendered on June 2. The decision maintaining the right of the Railroad Administration to establish freight rates was unanimous, whereas the decision maintaining the validity of the increased wire rates was not unanimous.

The Court reversed the decrees of the Supreme Court of North Dakota enjoining the Northern Pacific Railroad from enforcing an order of the Railroad Administration increasing rates in that state, and set aside lower court decrees which held that, under Section 15 of the Railroad Control act, pre-existing intrastate rates remained in effect as lawful police regulations.

In the wire decision, the Court sustained the increased telephone and telegraph rates established by Postmaster-General Burleson on Jan. 21. The Court set aside the South Dakota Supreme Court decrees enjoining telephone companies from increasing intrastate toll rates in compliance with the order of the Postmaster-General. It also dissolved Federal Court decrees permanently restraining the Postmaster-General from charging increased telegraph rates in Illinois. The decision affirms decrees in Massachusetts dismissing the State Public Service injunction, and dismisses original proceedings brought by the Attorney-General of Kansas.

It should be noted that this decision, while of great importance in confirming the Federal Government's power as paramount to that of the individual states in time of war, does not by any means give the Federal authorities such power in time of peace. The fear felt in some quarters that the normal rate-making power of the state public utility commissions is affected by the decision is therefore entirely groundless and these commissions will continue to have full jurisdiction over intrastate utility rates except in time of war, when the Federal Government may find it necessary to intervene.

## *Radio Communication for Power Transmission Lines*

NOW that the restrictions of war are removed against the civilian operation of wireless apparatus, companies operating long-distance transmission lines might seriously take under advisement the use of radio communication instead of that over wires. A number of companies before the war were using wireless equipment for communication between widely separated stations. These had, of course, to be abandoned during the time the Navy had control of all wireless throughout the country, but now that such restrictions have been removed, wireless will undoubtedly come again and upon an even larger scale.

There are two main objections that may be advanced against the use of wireless for communicating between stations separated by considerable distances. One of these is the relatively high cost of the apparatus; the other is that difficulty may be encountered on account of extraneous influences, namely confusion from other signals. The matter of cost tends to cancel out as the distance intervening between the sources of communication becomes greater, for the reason that the greater the distance the greater the saving in cost of crossarms, insulators and telephone wires and sometimes duplicate pole lines with specially wide right of way chargeable to the use of wireless. As to confusion from simultaneous transmission of messages through space between other sources this can be quite well taken care of.

Probably the chief advantage of wireless in long-distance transmission work is that communication can be carried on without interference from the transmission line. The time when communication is required most is usually during thunder storms and when the transmission line is in trouble; and it is at such times that the telephone line usually goes out of service, because of "static," a broken circuit or similar cause of trouble. Wireless overcomes this trouble, and herein lies its great advantage.

With the great advances made during the war in both wireless telegraphy and telephony and the perfection of apparatus for recording messages—a very real safety feature in the operating of electrical system over long distances during times of tenseness—we may look forward to wireless commercial applications gaining headway.

## *Steady Progress of Commission Regulation*

EVERY state in the Union, except Delaware, now has a state commission exercising some degree of control over public utility companies and such regulatory bodies have also been established in the District of Columbia, Hawaii and the Philippine Islands, according to a canvass of the states made by the Illinois Committee on Public Utility Information. No commission has ever been abandoned and none has suffered any withdrawal of the fundamental powers or jurisdiction it originally was given. On the contrary, the jurisdiction of most of the state commissions has been greatly extended within the past decade.

These facts attest to the success and nation-wide satisfaction that have been given by commission regulation of public utilities. They should serve as effective arguments for putting at rest attempts to restrict the jurisdiction of these commissions or to return part of their control to the fortunes of city governments to become a plaything for politicians seeking convenient election issues.

# Week's Events

## *Changes in Administrative Organization of N. E. L. A.—Manufacturers of Material-Handling Devices to Convene*

### PLANS FOR ANNUAL CONVENTION OF A. I. E. E.

**Institute Policies to Receive More Attention than Technical Topics at Thirty-fifth Annual Convention.**

The thirty-fifth annual convention of the American Institute of Electrical Engineers will be held at the Lake Placid Club, Essex County, N. Y., June 24-27. The technical program has been somewhat curtailed in order to leave ample time for the consideration and discussion of Institute policies at conferences under the auspices of the Committee on Development. Numerous modifications of the Institute's activities are being suggested which demand the attention and study of the entire membership.

The selection of the Lake Placid Club as the convention meeting place is a happy one as it insures unsurpassed opportunities for recreation and entertainment. Situated in the heart of the Adirondacks, the natural attractions of this region make it an ideal place for all kinds of outdoor life, and in addition, the excellent equipment of the club provides opportunities for practically all kinds of indoor and outdoor sports and games.

The convention will be opened Tuesday morning by the presentation of the annual presidential address by President C. A. Adams, followed by the introduction of President-elect Calvert Townley. The remainder of the session will be devoted to the presentation of three papers under the auspices of the Protective Devices Committee. Tuesday evening will be devoted to an informal reception and dance.

On Wednesday morning a session will be held at which the annual reports of the technical committees will be presented and discussed. These reports cover the activities of the various committees for the past year and the advances in the state of the art in their respective fields. At luncheon on Wednesday there will be a conference of the Committee on Development, section delegates and Institute officers.

Thursday morning's session will consist of an open conference under the auspices of the Committee on Development including section delegates and Institute officers, to which all members of the Institute are invited.

On Friday morning there will be a technical session under the auspices of the Transmission and Distribution Committee at which four papers will be presented.

It will be noted that no specific program has been scheduled for the afternoons and two evenings during the convention. It is believed that the conferences on Institute policies under the auspices of the Development Committee will occupy some of the unassigned periods and the Convention Committee this year, taking advantage of the special facilities of the Lake Placid Club, is arranging an unusually complete schedule of contests, games and other entertainments which will occupy all of the spare time available. A schedule of entertainment features will be announced at the convention.

The program of technical papers is as follows:

TUESDAY MORNING, JUNE 24.

President's Address, by Comfort A. Adams.

"Present-Day Practice of Transmission and Tie-Line Relay Protection," by H. R. Woodrow, D. W. Roper, O. C. Traver and P. MacGahan.

"Grounding the Neutral of Generating and Transmission Systems," by H. R. Woodrow.

"Grounded Neutral," by Wm. E. Richards.

WEDNESDAY MORNING, JUNE 25.

Reports of Technical Committees.

FRIDAY MORNING, JUNE 27.

"High-Tension Single-Conductor Cables for Polyphase Systems," by W. F. Clark and G. B. Shanklin.

"Electrostatic Field in Electric Power Cables," by R. W. Atkinson.

"Commercial Problems of 220-Kv. Power Transmission," by A. E. Silver.

"The Effect of Transient Voltages on Dielectrics—II," by F. W. Peek, Jr.

Accommodations at the Lake Placid Club should be reserved as early as possible by writing or telegraphing directly to the club. There is a telegraph and post office at the club and all communications should be addressed to Lake Placid Club, Essex Co., N. Y. All members intending to make the trip to the convention by automobile are requested to notify W. L. Merrill, of the Convention Committee, care of General Electric Co., Schenectady, N. Y., as far in advance as possible. A six-page leaflet on the detailed convention arrangements, together with train schedules and automobile road map may be obtained from F. L. Hutchinson, secretary, A. I. E. E., 33 West 39th street, New York City.

### EXECUTIVE COMMITTEE, POWER ECONOMY CONFERENCE, HOLDS IMPORTANT MEETING.

**Co-operation with Bureau of Mines and Committee's Progress Salient Features.**

On June 3, the Executive Committee, International Power Economy Conference, held a half-day session in Chicago, C. A. Tupper in the chair. At this meeting some of the more importance business dealt with included the report of the Committee to Co-operate with the Bureau of Mines, the reading of a paper by David Moffett Meyers, until lately advisory engineer, United States Fuel Administration, on "Peace-Time Conservation of Coal as a Permanent Measure," and presentation of various committee reports. A far-reaching plan was evolved for carrying on the important work of fuel conservation, and a tentative program outlining the work of the various

committees was drawn up. A large number of communications from manufacturers backing up the good work of the International Power Economy Conference were read.

The report of the Committee on Co-operation with the Bureau of Mines, read by F. A. Moreland, presented correspondence with a number of eminent fuel and consulting engineers and submitted for discussion before the Executive Committee the plan proposed by David Moffett Meyers. This proposed plan aims for the permanent continuance of fuel conservation under peace conditions. Action upon the plan would result in a saving of about 50,000,000 tons of coal annually, representing one-quarter of the interest on the nation's war debt with coal at $5 per ton. In brief, it is recommended that the work of the late Fuel Administration be carried on by the Bureau of Mines, that state conservation engineers be appointed for each state so as to maintain close contact with consumers of coal and act as distributing centers for the clearing house at Washington.

One of the first requirements is that educational and publicity methods be continued, otherwise the good work and interest aroused among the people will lose its impetus and never again attain the momentum reached because of the war and the good work done by the Fuel Administration. A committee of engineers and other citizens should be appointed by the Department of the Interior to assist in keeping the Bureau of Mines in close touch with problems and developments of the country, their recommendations being purely advisory. Such an advisory committee should include representatives of the four national engineering societies, labor organizations and members of the Federal Chamber of Commerce and others. The Committee of Consulting Engineers on Fuel Conservation and Publicity is suggested as a nucleus of the new advisory committee.

Correct power plant design for better fuel economy should be made compulsory, the encouragement of new developments leading to fuel conservation in power generation and the encouragement of low-temperature distillation of coal and the recovery of the valuable by-products are other recommendations advanced.

All of Mr. Meyer's recommendations were unanimously endorsed by the Executive Committee, International Power Economy Conference, and it passed a resolution promising to offer every means at its disposal to render such assistance to the Bureau of Mines or other governmental body toward obtaining the necessary funds and legislation for the conservation of fuel and improving power plant economy.

It was also decided to issue a bulletin fully covering these points and outlining the work of the Conference to date. This bulletin will be distributed in the near future.

## CRYSTALS FOR SOUND AMPLIFICATION DEMONSTRATED.

### New York Electrical Society Holds 374th Meeting—Developments in Electrical Communication Discussed.

The New York Electrical Society held its 374th meeting on May 26. This meeting, which was the last of the season, was one of the most interesting that the society has held. The program consisted of two lectures, one by A. M. Nicholson, research engineer for the Western Electric Co., and one by Major E. B. Craft, assistant chief engineer of the same company.

Mr. Nicholson, who spoke on "Speaking Crystals," described a method of substituting pure crystals for dry cell batteries in telephone circuits as a means of transmitting and amplifying sound. He illustrated his lecture by making actual demonstrations of the transmission of sound through 160 telephone receivers scattered through the audience. The property of crystals that permits them to be used as energizers of circuits is that by virtue of which any distortion of a crystal generates electricity along the edges or that the supply of electricity to the crystal causes it to distort. The polarity of the edges of a distorted crystal alternates plus and minus about the crystal. The change generated by a single distortion is dissipated very quickly, a fact that renders the effect of slow distortions of little value. To obtain the largest electrical effect by distortion, the latter should be of an alternating character of high frequency. This condition is obtained by alternate tension and compression or by twisting in opposite senses. Distortions of the most satisfactory kind for the generation of large voltages are obtained by subjecting the crystal to the vibrations of sound caused by the voice or to the vibrations of a sounding board on a piano or of a needle on a phonograph.

Mr. Nicholson treated the audience to several musical selections from a piano and a phonograph stationed in distant rooms. By wrapping tightly a piece of paper about a crystal of rochelle salts in a small vise so that the paper would act as a sounding board and suspending the crystal in the room, Mr. Nicholson transmitted the voice of a person speaking in a telephone receiver in a distant room.

The principle of generating electric charges in crystals is not new but it has never been applied to commercial uses. It was known 2000 years ago, was rediscovered by East Indian jewelers two centries ago and was investigated by Curie 30 years ago. Mr. Nicholson has been studying the phenomenon within the last two years.

Major Craft, speaking about war developments in electrical communication on land and sea and in the air, made a brief summary of work done by American engineers in providing means of communication for the Allied forces. In spite of the fact that war was impending previous to 1917, the signal equipment of the War and Navy departments was not improved in anticipation of hostilities. General Squier had, however, built up a reserve signal organization. The organization of the Bell Telephone System was drawn from largely for a personnel after war was declared and manufacturers of telephone equipment were set at work perfecting wireless equipment. At the end of six weeks after the problem involved in talking between planes in the air was undertaken, it was solved so that airplanes could communicate with each other as well as with a ground station. By the time the armistice was signed, all airplanes were equipped with wireless equipment. Equipment for more than 400 central telephone exchanges capable of accommodating 30,000 telephone lines was shipped overseas, and a telegraphic sending arrangement was devised whereby, by operating a typewriter, eight simultaneous messages could be sent over one wire by an operator at a typewriter. One telegraph station equipped with the new typewriter apparatus sent 40,000 messages in one day.

The development in telephonic and telegraphic equipment effected during the war would have occupied probably from 10 to 15 years during ordinary peace times.

## ALIEN PROPERTY CUSTODIAN PROTECTING AMERICAN INDUSTRIES.

### Taking Over of German Dye and Other Chemical Patents—Plans of the Chemical Foundation.

At a meeting of the Pittsburgh Section of the American Electrochemical Society, held in the auditorium of the Bureau of Mines Building, Pittsburgh, May 28, Joseph H. Choate, Jr., of New York, told some interesting facts not heretofore made public regarding the work that the Alien Property Custodian is doing for the protection of American industries.

Mr. Choate, who is a son of the former ambassador to Great Britain, Joseph H. Choate, Sr., is general counsel of the Chemical Foundation, which has acquired all of the patents taken from the Germans in this country by the Alien Property Custodian. During the period of the war Mr. Choate was associated with Alien Property Custodian A. Mitchell Palmer, now Attorney-General of the United States, and in this position had an unusual opportunity to become acquainted with the ramifications of German influence in this country.

At the start, Mr. Choate said nothing could have been more unwarlike than the office of the Alien Property Custodian, who incidentally was a Quaker, but this soon changed as the bureau began to function. The first step taken was the organization of a Bureau of Investigation, which had no power, however, could subpoena no witnesses or compel their testimony. So it went ahead largely by means of bluff in many instances but got the "dope" anyhow. "It appeared," said Mr. Choate, "as if all the German property, chemically speaking, had suddenly been sublimated."

Soon after beginning work it was realized that all interests could center on the dye industry, which was soon discovered to be the most important one in the country because so many other industries were dependent on it; the value of its products amounted to more than $3,000,000,000 a year. Before the war, 90% of our chemical products were brought over from Germany. The textile industry was struck a staggering blow from which it could hardly have recovered if it had to meet open or disguised German competition.

An evidence of the effect absence of German imports was having on the American textile industry, and that this was common knowledge by the German Government, was revealed by the speaker when he read a copy of a telegram secured by the Alien Property Custodian, sent by Von Bernstoff, former ambassador, to the German Government, as early as 1915, urging that dye shipments be stopped as it would practically demoralize the textile business in the United States and throw over 4,000,000 men out of employment.

Not only was the dye industry of greatest economic importance, but it also was of vital military importance as well. The entire German gas warfare was operated from its various dye works, and every chemical factory was regarded by the Germans as an arsenal, and these factories enabled Germany to keep up its terrific warfare of poisonous deadly gases.

What chance, said Mr. Choate, has a nation without a dye industry? If Germany is allowed to dominate this field again, as she did before the war, as soon as she recovers from her present economic depression she will immediately begin to try and gain world power as she did before.

Not only was Germany turning out large quantities of dye products for military purposes, but the dye industry was also marketing some 30,000 or 40,000 by-products which it was furnishing to other industries. Many of these were sent out under guise of medicinal cures.

The German dye industry was similar to a tremendously big trust, possessing cheap labor, cheap raw material, cheap chemists, and backed by a government that had absolutely no conscience, and pursued methods of price cutting that were as ruthless as were its military methods. Price-cutting way below the actual cost of production in order to squelch any American chemical industry was frequently resorted to by unscrupulous German officials. This monopoly represented a capital of $100,000,000; shares were sold at $400 apiece, and it had nearly one half a billion dollars of assets. It started and continued the most remarkable campaign of bribery and espionage that can be conceived.

As soon as some of these facts were discovered, the Alien Property Custodian, who determined that we must have a dye industry at any cost, started in to investigate reported German ownership of firms. At the beginning, he was not allowed to seize the patents, but it was soon realized that this was absolutely essential, and the necessary authority was secured from Congress. Over 4000 German patents were seized and are now being held as explained in the following.

It was decided that the best way to hold these patents, derive benefit from them and at the same time prevent them from getting into hands of the Germans again was to organize a separate concern. Accordingly the Chemical Foundation was organized as a private corporation, with a capital of $500,000, headed by such prominent men as Otto Bannard, of the New York Trust Co., and Cleveland H. Dodge, of the Phelps-Dodge Co. It was very essential that the affairs of the concern, which will own and defend the patents, be administered by men whose Americanism is unquestioned and who are familiar with German men and methods. The surplus arising from the operation of the Foundation will be used for research work, and a laboratory will be built for this purpose. Many universities and textile firms have already expressed their interest in the Foundation and offered it their support.

In closing, Mr. Choate said the Germans are desperate, with starvation and ruin facing them, the prospect of losing over $400,000,000, and they will make every effort, unscrupulous or otherwise, to regain the monopoly of the dye industry. They believe they can make dyes at just one half our costs, and no tariff, not even a 100% tariff, would deter them from their efforts.

The only solution, he felt, would be a plan similar to that used in England, France and Japan, which have a commission composed of dye manufacturers, textile manufacturers and neutral government representatives, whose approval must be secured before any imports are allowed. Such a plan was advocated in a telegram recently sent by 75 American manufacturers to President Wilson at Paris, and it is urgently hoped that such a plan will be put into effect in the near future.

Such a plan is absolutely essential if the chemical industry is to be saved, and if such a scheme is effected the speaker testified he felt that the work of the Alien Property Custodian would be crowned with success and German menace to peace and happiness would have ceased to exist.

## MILWAUKEE ELECTRICAL MEN ORGANIZE NEW ASSOCIATION.

**Jovian and Electrical Leagues Combined in Electrical Association of Milwaukee—Officers Elected.**

The Milwaukee Chapter of the Jovian League recently combined its membership with that of Milwaukee Electrical League to form a new electrical Board of Trade to be known as the Electrical Association of Milwaukee. The new association was formed by a joint committee of the two previous organizations which it automatically disbands. Every branch of the industry will be represented in the new association and any resident of Milwaukee actively associated with the industry is eligible for membership.

The following officers have been elected to conduct the affairs of the association during the coming year: W. J. Aitken, president; F. W. Ziekursch, vice-president; A. L. Pond, treasurer; G. G. Post, secretary. The following directors, representing the six constituent sections, have been chosen: H. A. Brauns, director from the contractors' section; Phil. Polachek, from the dealers' section; F. W. Greunsel, from the jobbers' section; F. W. Ziekursch, from the manufacturers' section; G. G. Post, from the public utilities' section, and A. J. Sweet, from the sales and engineers' section.

The objects of the association as stated in the constitution are as follows:

*Section* 1.—The objects of this association are to promote social and commercial goodfellowship amongst its members, to further the interests of the electrical industry both locally and nationally, and to serve in the civic advancement of the community.

*Section* 2.—It shall also be the object of this association to promote the organization of a national body representative of the entire electrical industry in the nation and having objects corresponding to those of this association but of nation-wide or international scope, and it shall be the purpose of this association to represent such national body locally.

The following chairmen of committees have also been appointed: A. L. Pond, treasurer, chairman of Membership Retention Committee; G. G. Post, secretary, chairman of New Membership Committee; Phil. Polachek, chairman of committee to co-operate with the Contractors' and Dealers' Association to further the interests of the convention of that association to be held in Milwaukee in July; A. J. Sweet, chairman of committee to draft a code of proceedings.

## HANDLING MACHINERY MANUFACTURERS TO HOLD COALITION MEETING.

**All Manufacturers of This Equipment Invited to New York Meeting.**

All manufacturers of mechanical handling machinery, equipment and accessories are invited to attend the coalition meeting of the Material Handling Machinery Manufacturers' Association, 35 West 39th Street, New York City, which will be held at the Hotel Astor on June 11. This includes all manufacturers of cranes, winches and hoists; elevators; gravity and power conveying machinery and apparatus; industrial truck, tractors and trailers; bulk handling machinery; and all makers of equipment and accessories such as storage batteries, bearings, ropes for hoists, buckets, electric controllers and apparatus, etc.

Among the speakers for the meeting are James H. Collins, special writer of business articles, and Francis Holley, director of the Bureau of Commercial Economics. A general "forum" discussion will be conducted in the afternoon. The discussion will take up the subjects of ways and means for promoting a more general knowledge of the great economies which may be effected through the use of mechanical handling equipment, the tremendous value of human beings in conserving physical energy through the use of mechanical handling, the bearing which modern machinery has on the subject of foreign trade, etc.

For the evening meeting, a mass gathering is planned, to which will be invited the members of the Merchants' Association, Chamber of Commerce of New York, the Traffic Club, the Railway Club, city officials of New York, and the members of the New York and New Jersey Port and Harbor Commission. At this evening mass meeting addresses will be made by Hon. Theodore Burton, former United States senator and now director of the Merchants' National Bank; and by Murray Hulbert, Commissioner of Docks, New York.

## EXECUTIVE WORK OF THE NATIONA... DECENTRALIZE...

**President Ballard to Devote Himself to More Gen... on the Four Vice-Presidents, Each of Wh... for Broadening ...**

President R. H. Ballard of the National Electric Light Association went to New York City at the close of the Atlantic City convention to discuss matters affecting the activities of the Association during the coming year. Meetings of the Executive Committee and a number of conferences were held at association headquarters with different men interested in the welfare of the industry and much progress was made in the settlement of various questions of association policy.

One of the most important matters which was finally arranged is a new plan for the active participation of the four vice-presidents in the real work of the association. Such a plan is especially desirable because of Mr. Ballard's residence on the Pacific Coast. However, it serves also the good object of decentralizing the burden of responsibility formerly resting upon the president and bringing the vice-presidents into close contact with certain phases of the association work.

The plan approved is as follows:

President Ballard will devote himself specially to matters of a general executive character.

Martin J. Insull, of Chicago, first vice-president, will be executive vice-president. He will be present to preside over all meetings of the Executive Committe in case of the necssary absence of the president.

M. R. Bump, of New York City, second vice-president, will supervise the work of the Technical and Hydroelectric Section. Mr. Bump will also specialize on the preparation of plans for organizing the entire country into geographic districts and sections.

Frank W. Smith, of New York City, third vice-president, will supervise the Accounting Section in the same way that is outlined for Mr. Bump with

The committee having the meeting plans in charge are W. J. L. Banham, chairman of the Otis Elevator Co.; Frederick Stadelman, of Wellman, Seaver, Morgan Co., and E. Logan Hill, of Heyl & Patterson. They feel that the value of the program is so vital at this time to the mechanical handling industry that this will be an epochal meeting and justify a quarterly program of the future. Calvin Tompkins, formerly dock commissioner of New York, president of the Association, will preside. The manager of the Association, Zenas W. Carter, states the meeting is not to be confined at all to members of the Association but that the invitation is to all interested to attend and take part in the discussion, as the problem involved is nationally remedial and needs the co-operative ideas of all manufacturers in the industry.

The advertising managers of the companies manufacturing these products are also invited to hold a preliminary conference at the Hotel Astor in the evening of June 10, beginning at 8 o'clock, at which time it is planned to form an Advertising Council of the Material Handling Machinery Manufacturers.

## ELECTRIC LIGHT ASSOCIATION TO BE ...AND INTENSIFIED.

**...More Gen... ...Executive Matters—More Responsibility to Be Put ...ch of Wi... ...Will Direct Executive or Section Work—Plans ...oadening ... ...Activities of Association.**

the Technical and Hydroelectric Section. Mr. Smith will also supervise the work at association headquarters.

W. H. Johnson, of Philadelphia, fourth vice-president, will supervise the activities of the Commercial Section and the Electric Vehicle Section, following the same method as the other vice-presidents with respect to the other sections. Mr. Johnson will also specialize on the enlargement and development of the company sections.

The arrangement by which the work of the sections is assigned directly to the various vice-presidents does not, of course, preclude a chairman of a section from taking up directly any matter with the president, if he so desires.

Another matter which was under discussion during the visit of Mr. Ballard in New York City is the possibility of two or more general executive conferences of the company members at appropriate times during the year. The object will be to discuss some of the questions affecting the entire industry. It is suggested that possibly one of these conferences might be in New York City and it is also suggested another be in Chicago.

Mr. Ballard spent two weeks in the East after the convention, visiting several large cities before going back to Los Angeles. He plans to return to New York in September for a stay of considerable length. He will return again in December or January. In order to complete plans for the 1920 convention he will come east again in April of that year. With these visits and the new plan of organization of the vice-presidents, supplemented by correspondence, Mr. Ballard expects the association work to go ahead on the broader and more active lines which ar eoutlined for the coming administrative year.

## WORK OF ORDNANCE DEPARTMENT EXPLAINED BY MAJOR GRAY.

At the meeting of the Electric Club of Chicago held on May 29, Ainslie A. Gray, formerly managing editor of the ELECTRICAL REVIEW and during the war major in the Ordnance Department, United States Army, gave an inspiring illustrated talk on the work of that department. He explained how the personnel of this branch was less than 1000 officers and men at the time we were drawn into the war and only a few arsenals were then turning out ordnance supplies, whereas at the time the armistice was signed there were over 8000 American factories with over 1,400,000 workers engaged in ordnance production. The prodigious scale on which this work was carried on was described with the aid of many astounding data involving figures of such gigantic magnitude that few people could grasp their significance. Major Gray showed illustrations of the principal types of arms, guns and heavy ordnance and gave a graphic picture of what the intensified production thereof meant in shortening the war. Characteristic of American ordnance production was the construction to permit of quantity production and perfection of design and inspection to make the material of maximum destruction to the enemy and of minimum hazard to our own men.

## ELECTRIC MAKES RECORD NEW YORK-ATLANTIC CITY TRIP.

Making the 124.6-mile trip in 5 hr. 39 min., an electric passenger car manufactured by the Baker R. & L. Corp., of Cleveland, Ohio., bettered by 18 min. the electric vehicle record between New York and Atlantic City. The old record, made by a car of the same type was 5 hr. 57 min., and had stood since 1917.

The trip was made under the auspices of the New York Electric Vehicle Association and in conjunction with the annual convention of the National Electric Light Association which was being held at the resort at the time. Herbert Mould was the official observer, while DePeyster Stagg drove the car.

The speedometer reading showed an actual mileage of 124.6 miles. The current consumption averaged 2.6 amp. hr. per mile and the speed averaged 22½ miles per hr. The trip was made by way of Staten Island and Lakewood, with a stop at the latter place at lunch time for a battery boost.

## NEW OFFICERS OF NEW YORK ELECTRICAL SOCIETY.

At the annual meeting of the New York Electrical Society held in the Engineering Societies Building, New York City, on June 5, the election of officers for the ensuing year resulted in the choice of the following: President, Edwin B. Katte; vice-presidents, C. D. Gray, L. G. Nilson, John S. Timmons; secretary, George H. Guy; treasurer, Thomas F. Honahan. The last two gentlemen were re-elected.

## AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS TO MEET.

The semi-annual meeting of the American Society of Heating and Ventilating Engineers will be held on June 10, 11 and 12 at Pittsburgh, Pa. The meetings will be held concurrently with the convention of the National District Heating Association.

# Commercial Practice

## *Handling Style Merchandise—Electric Trucks in Bakery, Coal and Ice Delivery — Pueblo Appliance Campaigns*

### METHODS OF HANDLING STYLE MERCHANDISE POINTED OUT.

**Value of Such Goods Also Shown in Report of Merchandising Committee.**

The value of a line of style merchandise to the electrical dealer and many valuable suggestions for buying, pricing, displaying and advertising such goods are contained in the report which the Committee on Merchandising presented at the recent convention of the National Electric Light Association at Atlantic City. This division of the report was prepared by a subcommittee of which C. E. Greenwood, of the Edison Electric Illuminating Co., Boston, Mass., was chairman.

Electrical merchandise may be divided into three classes. The first includes the staples, such as incandescent lamps, plugs and numerous other items. In the second class are the labor-saving devices, most prominent of which are the washing machine, vacuum cleaner, ironing machine, fireless cooker, and the like. And in the third class may be placed portable lamps, fixtures, artistic loving-cup urns and other electrical articles that have received the attention of the artist designer as well as of the heating engineer. This last group is called style merchandise.

The retailer of electrical devices is confronted with certain handicaps in the sale of his merchandise and is at a distinct disadvantage to the merchant in other lines because of the very nature of his product. There is constant demand for the staples as necessities, but before labor-saving devices can be sold, the idea of the use of the devices must be sold. This group constitutes an important part of the sales of any electrical retailer. He is, therefore, confronted with the important problem of how to bring the people to his shop.

The central-station merchant has an advantage in having prospective purchasers coming to the store on other missions than shopping; that is, electric service customers coming to pay bills, to make application for service, or to consult representatives on some matter in connection with their service supply; but, nevertheless, he is confronted with the important problem of obtaining favorable attention to his merchandise before his selling force can change passive prospects into active buyers. Style merchandise will aid in solving this very problem.

Another value in style merchandise lies in its power to draw people to the store because of its inherent shopping appeal. It may be a novelty attraction, or an appeal to the instinct of beauty which every human being possesses. This merchandise gives the purchasers an opportunity to express their individuality. In addition to this shopping appeal, style merchandise has other practical values in the showroom of the central station because it increases the number of items which can be sold at a profit, beautifies the store and gives it shopping personality.

In buying such goods the central-station merchant must consider goods for which the public will shop. This involves an analysis of the local buying public, which is usually made up of a combination of ultras, middle class and the cheaper trade. Each central station merchandising man must analyze his public and select such an assortment of style merchandise as will appeal to the greatest number of his prospective purchasers, remembering always that the great number of buyers are striving to follow what is acceptable to the ultra trade. It is recommended that the merchandising man be prepared to get in touch with the source of supply for the different classes of style goods. Practical merchandising suggestions can be had from the manufacturers. The committee also believes that the merchandising men should prevail on some of the manufacturers to improve their styles. The percolator, toaster, chafing-dish, portable lamp, candle holder or fixture can be made in designs of unusual attraction to appeal to women purchasers.

If such goods are well bought the question of pricing is simple. As a rule, the mark-up on portable lamps is 100% on cost and 50% on selling price, and it is customary when making special offers to have a mark-up of 50% on cost and 33⅓% on selling price. If it is found that a certain item does not move, it is considered standard practice for the merchandising man to reduce his price materially and move the stock. Successful merchandising involves the question of turn-over, and this requires that when a loss must be taken, it be taken immediately—the necessary sacrifice in price being made to move the goods.

In displaying portable lamps and other style numbers, each piece should be arranged so as to express its own individuality. When displaying portable lamps, it has been found that an olive green velour makes a good covering for tables and it is likewise a good material for background effects. In window display work one beautiful number properly staged with the right background will attract more attention and bring more buyers into the store than a miscellaneous assortment of style merchandise. In window display work it is a good plan to show numbers which make an ultra appeal, as the big middle group of buyers will be attracted by this class of display and will come into the store to see what can be found with the same style appeal at a price which will fit their pocketbooks It is a good plan to group style merchandise on a price basis and to keep the higher priced merchandise separated from the lower priced. The cheaper merchandise is never raised to the level of the higher priced goods by being shown in combination.

Style merchandise, particularly portable lamps, should be advertised throughout the year, with emphasis during the Christmas holidays. The effect desired from advertising is to carry the showroom display to the reader of the advertisement, for by this method the general effect of the store is multiplied.

As a final thought on the subject the committee quotes a remark made by a high official of one of the largest chain store organizations in the country, who

said, "Successful merchandising is based on good-will, and the chain store uses every means it can devise to create and develop it." A line of style merchandise should be introduced by every central-station merchandising department for its value as one means of developing good-will, because the attractiveness of style merchandise to shoppers is an invitation to the store.

## DELIVERING BREAD WITH ELECTRIC TRUCKS.

**Electric Trucks Used Extensively by Bakery Concerns in All Parts of the Country.**

The representative bakery concerns in this country have selected, after exacting tests, the electric commercial vehicle as that mode of transportation best suited to their business for, in addition to being the most efficient, economic and dependable of any type of transportation, the electric truck is the cleanest and simplest to operate.

The Ward Baking Co. employs about 225 electric delivery wagons; Consumers Bakery Co., Kansas City, Mo., uses over 60 electric trucks; Mills-Fox Baking Co., Detroit, Mich., uses over 50 electric wagons. The Campbell Baking Co., of Kansas City, employs 35 "electrics"—and Kansas City is a city of hills, but the hundred odd electric trucks used daily there by the two bakeries cited cover easily its mountainous hills.

Dozen of bakeries, using electric transportation, could be indicated if space permitted, but reference will be made here to but one more, namely, Cushman Sons Co., of New York City. This concern started using both "electric" and "gas" trucks about 10 years ago. After a prolonged period of exacting experimentation, this company has arrived at the conclusion that electric vehicles are not only the most satisfactory medium for city transportation, but that comparative operating costs also show up to the decided advantage of electric transportation. Proof of Cushman Sons Co.'s belief in the electric truck is evidenced by an order placed recently for 23 electric units, such being but the forerunner of even larger electric truck installations anticipated by this company in the not far distant future.

## ELECTRIC TRUCKS DELIVER COAL AND ICE.

In Boston, particularly, Chicago, New York and elsewhere electric trucks are employed extensively in the movement of coal from the yards to consumers. A study of comparative operating costs indicate that coal is moved at a lower cost per ton-mile by electric trucks in the cities than by any other form of transportation. This fact is being realized by many large coal companies and, as a result, there are some far-reaching developments contemplated in the further application of electric trucks to this particular class of business, which will be reviewed in detail in subsequent articles.

Electric trucks, by virtue of their successful operation, have won for themselves the high esteem of representative manufacturers of and dealers in ice. The Consumers Co. of Chicago, Ill., employing 26 electric vehicles, may be taken as indicative of the introduction of electric transportation into the ice business. Owing to the mildness of last winter, there will be a great scarcity of ice this summer and consequently prices of this very necessary commodity will probably reach new heights. Those companies using electric trucks will be conducting the distribution phase of their business—probably its most costly feature—at minimum expense possible, besides will be assured of uninterrupted service from their electric transportation units, blessed with but extremely few moving parts and very simple control.

## PUEBLO, COLO., COMPANY CONDUCTS SEVERAL SUCCESSFUL CAMPAIGNS.

**Arkansas Valley Railway, Light & Power Co. Active in Appliance Sales.**

The Arkansas Valley Railway, Light & Power Co., of Pueblo, Colo., estimates that during the present year more than 500 electric vacuum cleaners will be required to satisfy the demand in Pueblo. The estimate is based on the very successful results of a recent campaign. Later another campaign will be opened on small labor-saving electric appliances. The commercial department of the company also recently completed a very successful washing-machine campaign which resulted in the sale of 18 machines and prospects for many more.

In one week recently the local contractors of Pueblo, in co-operation with the company, secured contracts for wiring 52 already-built houses.

## REDUCING COSTS OF SERVING THE RESIDENCE CUSTOMER.

The revenue obtained from residence lighting is relatively small for many utilties supplying a mixed power and lighting load, because the unit connected load is individually small and it is active only a short period of time. Moreover, the cost of rendering bills for this class of service is high in proportion to the revenue, which is small. There is meter reading, billing and the necessary bookkeeping, as well as the incidental expenses such as those due to changing tenants, disconnecting meters and services with vacated premises and meter testing and also a large portion of the repair calls.

Considerable attention is now being given the subject of reducing the relative cost of serving the residence customer by less frequent meter reading, billing, etc., and by encouraging an increase in revenue by the wider and more frequent use of current-consuming devices.

## TWO-THIRDS OF CUSTOMER STOCKHOLDERS BUY AGAIN.

T. C. Erringer, manager of the Securities Department of the Northern States Power Co., Minneapolis, Minn., is authority for the statement that less than 4% of home investors in the preferred stock of the company have failed to complete their partial-payment contracts or have resold their stock during the past four years. On the other hand, 65% of the home investors have purchased additional stock.

## ELECTRIC RANGES POPULAR AT MINNEAPOLIS.

Three new apartment buildings now under construction in Minneapolis, Minn., will require 137 electric ranges, orders having recently been placed for the equipment and its installation.

# Operating Practice

## *Driving Pole Stubs with Motor Truck—Ventilating Basement Converter Substations—Selection of Duct Sizes*

### DRIVING POLE STUBS WITH MOTOR TRUCK.

**Reinforcing Poles with Piles in Marshy and Silty Ground.**

On account of severe floods and excessive volumes of water changing its channels, the Pacific Telephone & Telegraph Co. was forced to take steps to prevent their toll line between Los Angeles and Long Beach from being damaged. It was determined to do this by sinking piles alongside the poles erected, to act as stubs. It was impractical as regards time as well as because the marshy nature of the soil prevented resetting of the poles.

A portable pile driver having the guides for the hammer designed for attachment to the poles alongside of which the piles were to be sunk was used. This consisted of two prongs on the top of the hammer which automatically releases the hammer from the cable when it reaches the top of the guide and automatically re-attaches the cable to the hammer after the latter has dropped, ready for another blow. The hammer was made of concrete and weighed 650 lb. The hammer is lifted by steel cable running through a snatch block to a hauling winch on the motor truck used to haul the outfit. A steel cable runs from the hauling winch in truck, through snatch blocks on the rear end of the truck on the pole at the ground line and near the top of the pole to the hammer in the guides. In some cases the truck was located 75 ft. away from the pole at which the pile was to be driven. with a torrent of water 40 ft. wide passing between.

Piles 18 ft. in length were driven to a depth of 14 ft. alongside the poles and the poles were secured to these pile stubs in the usual manner. The piles were driven in an average time of 30 minutes, at a labor cost per pile driven of $6. The hammer and guides were constructed in the company's shops at a cost of approximately $35. By the use of this equipment the poles were very securely reinforced for a little over 10% of the estimated cost of relocating the line as first proposed, resulting in a saving of approximately $7500.

Similar equipment can be used for stubbing poles set in marshy or silty soil wherever there is a road of firm ground in the vicinity of the poles for the motor truck.

### METHOD OF VENTILATING SYNCHRONOUS CONVERTERS IN BASEMENT SUBSTATION.

Obtaining proper ventilation of substations located in the basement and sub-basements of buildings is one of the most difficult problems in this type of substation. These substations are frequently 35 to 45 ft. below the surface of the ground, and air reaching them must be taken in through the sidewalk or from some other place without picking up dirt and dust or moisture, and without interfering with the pedestrian traffic. The large quantities of air required to carry off the heat in large machinery is also a factor that makes the problem of proper ventilation a difficult one.

One operating company employing a number of basement substations containing several synchronous converters has adopted a rather interesting method of ventilation that has proved at once inexpensive and satisfactory for cooling 2000-kw. converters. Air-blast transformers are used to step down the voltage for the converter, and the conductors from transformers to converter are run in conduit, their length being about 10 ft. Several spare ducts were installed at the time the conduit or ducts were installed for use as air passages. The ducts terminate in a header underneath the transformer, so that the air from the blower divides, part going through the air-cooled transformer and part through the vacant ducts and the ducts containing the conductors. At the machine end of the cables is a baffle, the purpose of which is to allow a portion of the air to pass through the cable ducts, the balance to circulate through and around the converter.

A blower giving approximately 1½ oz. pressure has been found to suffice for ventilating transformer and converter in the above manner, while also reducing conductor temperatures.

### OVERCOMING CONDENSATION OF MOISTURE IN OIL CIRCUIT-BREAKERS.

Trouble has been caused by moisture finding its way into oil-filled circuit-breakers of the outdoor type for voltages from 6000 and above. This moisture appears to be due to breathing action or condensation of moisture rather than to rain, dripping and capillary action. In some instances this moisture has gradually accumulated until the circuit-breaker has broken down due to dielectric failure; in other cases the moisture has assumed appreciable proportions and in cold weather has become frozen with the same result.

It is claimed that the condensation can be prevented by providing vents above the oil, so located that a free circulation of air may pass over the surface of the oil and yet so protected that wet cannot trickle, drip or in any other manner gain entrance.

### SELECTION OF DUCT SIZES FOR UNDERGROUND CONSTRUCTION.

The cost of conduit construction among the larger central-station companies represents a large part of the entire plant investment, hence great care must be exercised in determining the kind of material and type of construction employed. To determine the general practice as to conduit construction, a questionnaire was sent to a number of companies by the N. E. L. A.'s Committee on Underground Construction and Electrolysis. This was presented in the committee's report at the convention.

This questionnaire seems to show that fiber conduit is rapidly coming into favor and is already considered standard construction by several of the larger companies.

The consensus of opinion is that 3½-in. ducts are the largest that need be installed, but one company is standardizing on 4-in. fiber duct for cables of approximately 2¾-in. diameter, the reason given for the selection of this size being ease in installation and the better ventilation of the system after the cable is placed in service. Several companies use 4-in. and even 4½-in. duct in special cases where it is necessary to avoid sharp bends at the entrance to stations or substations.

In most city streets, however, it is necessary to keep the size of the whole duct line within reasonable limits and, consequently, the size of the individual ducts must be kept down. It should further be borne in mind in considering this problem that even where there is ample space to install 4-in. in place of the usual 3½-in. ducts, the size of the conduit line and, consequently, its cost will be from 15 to 20% higher.

A 3½-in. fiber conduit is large enough to permit of the installation of a cable having an outside diameter of 3.2 in., the only difference in the method of installation being the use of a special cable eye instead of the basket or other form of grip usually employed for pulling-in.

The accompanying table shows the largest size of duct in use, together with the kind of material and the largest diameter of cable installed. This summary also shows the maximum kv-a. transmitted per circuit and such other information as has a direct bearing on the problem of conduit sizes.

The replies seem to indicate that from 5000 to 7500 maximum kv-a. per circuit is usual practice in underground transmission work. The general opinion is that it is not desirable to concentrate more than 7000 to 8000 kv-a. in a single circuit, and that 3-in. outside diameter is about the largest cable now in use. It is also recommended that 35,000 kv-a. be the maximum load which should be carried in a single duct line, and that the size of a single conduit be limited to 16 to 20 ducts.

DATA ON DUCT SIZES.

| Location. | Ducts. Size, in. | Kind. | Recommended maximum No. | Approx. outside diameter. | Weight, lb. per ft. | Cable. Conductor size. | Insulation. | Voltage. | Kv-a. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| Baltimore* ..... | 3¾ 3½ | Tile | 20 | 3 | | 4/0-3 condr. | 9 × 5 / 32 | 26000 | | Have found 3½-in. duct large enough. |
| New York ..... | 3 | Single tile | 18 | 2.82 | 14.1 | 650,000 C.M. 3 condr. | | 8000 | | 3-in. tile duct prefered. In closely populated sections single duct is used. |
| | | | | | | 350,000 C.M. sector | | 6600 | 3500 kw. | Tile duct resists much better action of destructive agencies, simpler to repair its breaks and easier for pulling cable. |
| | | | | | | 350,000 C.M. sector | | 15000 | 7500 kw. | |
| Los Angeles ... | 3 | Fiber | 20 | 2.96 | 10.37 | 4/0-3 condr. | | | 5000 | Prefer fiber duct, less danger from electrolysis, lower cost of completed conduit, minimum of loss in handling and minimum of skill required on installations; 3½-in. duct is preferred; alows installation of two 100,000 C.M. low tension cable. |
| Detroit ..... | 3⅝ (old) Proposed 4 (new) | Single tile and fiber | 20 | 2.82 | 8.6 | 2/0-3 condr. | 9 × 7 / 32 | 24000 | 7000 | Favorably disposed to installing fiber duct, lower cost and better construction. |
| Montreal ..... | 3½ | Tile and fiber | 18 | 3.08 | | 4/0-3 condr. | | 13000 | | Believe 3½-in. duct large enough to accommodate cables carrying the maximum amount of power which should be concentrated in one duct or cable. Prefers single tile and fiber ducts. |
| Pittsburgh ..... | 3¼ | Tile | | 2.7 | 10 | 1,000,000 C.M. duplex | | 220 | | Prefer 3½ or 4-in. duct to allow heat to more rapidly radiate from cable; finds tile duct cheap and good insulator when cable burns out in duct. |
| Boston ..... | 3½ | Fiber | 16 | 3.1 | 11 | 300,000 C.M. 3 condr. | 9 × 6 / 32 | 25000 | 10000 max. 7500 contin. | Fiber duct preferred; experiences less electrolysis corrosion and better construction; 3½-in. duct large enough. |
| Chicago ..... | 3½ | Stone | 20 | 3 | 11 | 250,000 C.M. 3 condr. | | 22000 | | Prefer stone duct; cheaper and arc resisting; 3½-in. duct would be proper size. |
| Louisville ..... | 3 (old) 3½ (new) | Tile & fiber (old) fiber (new) | 16 | 2.625 | 9.2 | 250,000 C.M. 3 condr. sector | | 15000 | 5000 max. | Prefer fiber duct; better construction and lower cost. |
| Newark ..... | 3½ | fiber | 24 | 2.9 | 10.3 | 250,000 C.M. sector 3 condr. | 9 × 9 / 32 | 26400 | 9000 max. 7500 contin. | Prefer fiber duct; better construction and lower cost; 3½-in. duct of sufficient size to accommodate cable carrying maximum power which should be concentrated in one cable. |

*Municipal conduits.

# Contracting-Construction

## *Handy Tools for Electricians—Washington Contractor-Dealers Meet—N. Y. State Convention—Building Record*

### HANDY TOOLS FOR ELECTRICIANS AND MAINTENANCE MEN.

**Methods of Construction and Application of Several Handy Home-Made Wiring Devices.**

By James A. Perry.

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*This is the last of a series of four articles describing the uses and construction of a number of handy tools for electrical men. Although some of these descriptions have appeared in previous issues of the* Electrical Review *and other journals, they are compiled in this series with others in a very convenient form which adds greatly to their value and for reference purposes. The first three articles of this series describing a number of practical devices for the plant electrician appeared in our issues of May 17, 24 and 31.*

When a wireman has a great many fixtures to install, the quickest way of handling the job is to scrape and twist connections for possibly fifty of them, and then solder and tape them later. This procedure saves time, and hence, money. Furthermore, if the ladle method later described, is used, splotches of solder on the floors can be avoided, and there will be

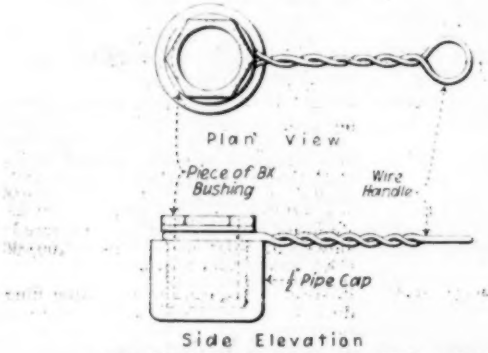



**Fig. 20—Ladle for Soldering Fixture Leads.**

no blackening of the ceilings that occurs when joints are soldered with a blow torch.

The soldering of the fixture connections in a job like that above referred to can be most readily effected by using a small ladle such as that indicated in Figs. 20 and 21. Either of these ladles can be heated by the ordinary blow torch. In soldering, it is only necessary to dip the twisted and fluxed ends of the fixture connections into the little pot of molten solder, and then strike the connection a tap or two with the hand to knock off the surplus solder.

The ladle of Fig. 20 is made by screwing a part of a steel armored-cable bushing into a ½-in. gas cap. This provides a holder in which the wire of the handle can engage.

Another method of making a soldering ladle of a little larger capacity is shown in Fig. 21. In this, four holes are bored in a ½-in. or ¾-in. pipe cap, and the wire for the handle is threaded through them as shown. The cap cannot turn in the wires, hence, the threading provides a very substantial attachment. A wood handle (Fig. 21) will be found very convenient because if the handle is made of wire only, it is apt to become uncomfortably hot.

How to best carry his soldering paste is usually

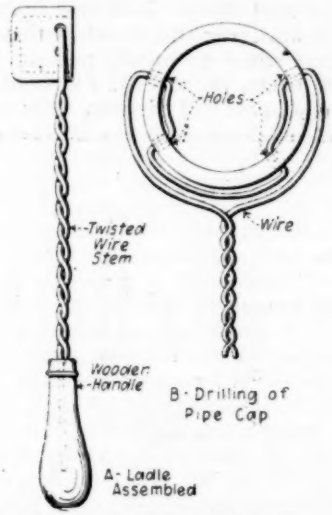



**Fig. 21—Long-Handled Ladle.**

somewhat of a problem to the average wireman. It is supplied by the manufacturers in cylindrical tin or pasteboard containers, which are of rather inconvenient size to carry to the points where the soldering is being done. One scheme that has worked out very

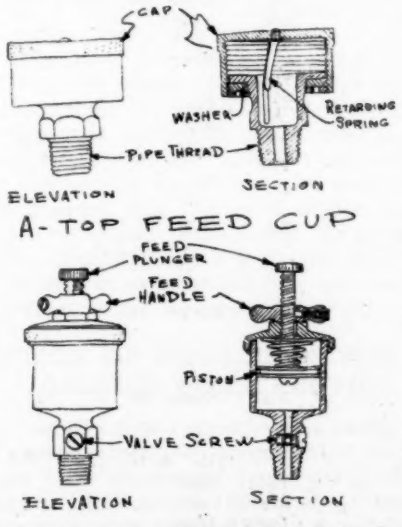



**Fig. 22—Grease Cups for Carrying Soldering Paste.**

well in practice, is to transfer to a grease cup some of the paste and to use the grease cup in feeding it to the

joint to be soldered. Fig. 22 shows grease cups of two types used for this purpose. In that of *A*, which is the cheaper, the paste is fed through the orifice by turning the top. A steel retarding spring which will fit into a groove at each revolution, prevents the

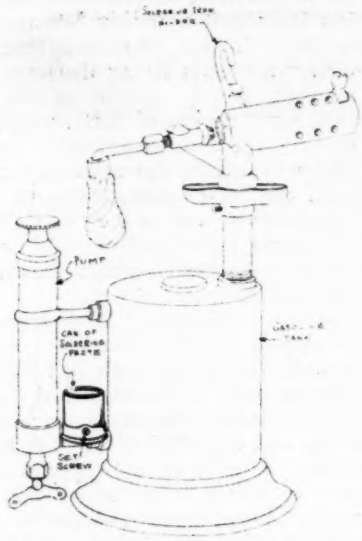
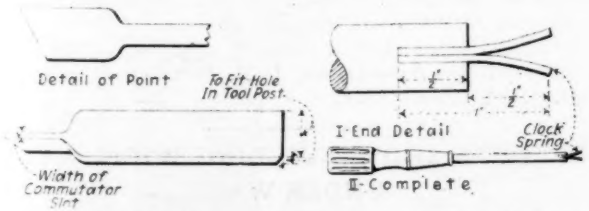



Fig. 23—Paste Can on Blow Torch.

cap from unscrewing easily. The grease cup at *B* is the most convenient because the paste can be fed either by a direct push on the feed plunger or by turning the feed handle. Furthermore, the valve screw provides a means whereby the cap can be entirely closed before it is placed in the wireman's kit for the night, or for transportation.

Another method of carrying paste that has been used by some wiremen is that shown in Fig. 23. In this, a small can to contain the paste can be directly attached to the blow torch by using a piece of shade holder. This makes a very convenient arrangement for certain kinds of work. By loosening the set screw in the holder the can can be easily removed for refilling.

Sometimes the electrician finds it necessary to




Figs. 24 and 25—Tool for Slotting Commutators and Screw Holder for Screw Driver.

re-slot commutators that were formerly slotted but that have worn down, or to cut mica from those that were not, but which should have been, slotted by their manufacturers. For a make-shift arrangement, the mica can be scraped out with the edge of a hacksaw blade, but a much better and more accurate tool is that shown in Fig. 24. It is forged from a piece of tool steel, and in use is held in the tool post of a lathe. The armature that carries the commutator to be slotted is maintained between the centers of the lathe. Then the slide rests with the tool described and its tool post is worked back and forth. Each time it goes forward, the tool should be set to cut some of the mica from between two commutator segments. The action is, in a general way, similar to that of a planer or shaper. After one slot has been cut to a sufficient depth, the armature is rotated and the next one cut, and so on, until the entire armature has been re-slotted.

Screw-drivers especially designed for starting screws, that is, to hold the screw in the end of the driver for insertion in inaccessible places, are regularly made by the manufacturers. Their prices are very reasonable, hence if one requires a screw starter he will probably find it most economical to purchase the commercial article. However, if such for some reason or other is not available, one can readily be

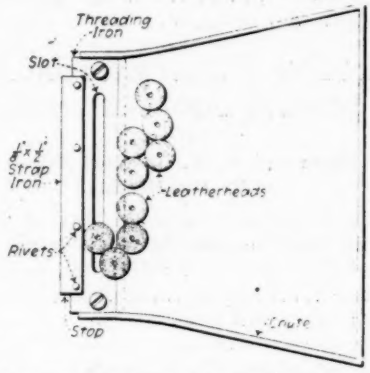



Fig. 26—Plan View of Stringing Device.

made as shown in Fig. 25. The end of an old screw driver is cut off square, as shown at *I*. A slot is sawed in the end. Into this slot, two pieces of clock spring, possibly 1 in. long by ¼ in. wide, are soldered. The pieces to be soldered should all be filed bright, and tinned with sal-ammoniac as a flux before they are inserted in the slot. After they have been thus prepared and inserted, additional solder should be sweated on. In using the tool, the two clock-spring leaves are pressed together and inserted in the slot of the screw. When the pressure on them is released,

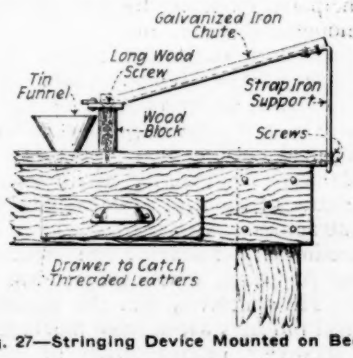



Fig. 27—Stringing Device Mounted on Bench.

they will grip the screw and hold it while it is being started.

Every man that does much knob-and-tube work must have thought at some time or another of the time that is required to string leather heads, that is, to insert the nails in the leather washers that are used with porcelain knobs and cleats to prevent the breaking of the porcelain. Figs. 26 and 27 show a simple device whereby this threading can be accomplished quickly and with minimum labor. In a large shop the threading device should be installed in the stock room. Then the stock-boy can use his spare time in putting nails in the leather heads. When the nails are drawn

out of stock for a job, the leather heads will be in place on them, all ready for insertion in the knobs. The arrangement consists (Figs. 26 and 27) of a galvanized-iron inclined chute into which a supply of leather heads is dumped. The heads slide down against a stop of ⅛ in. by ½ in. strap iron. When they are in this position, the holes in the heads lie directly over a slot in the threading iron, and a nail is driven into each leather head and into the slot. Then the nail and the leather head are taken up and dropped through the funnel into the drawer prepared for their reception. The constant pounding causes the heads to continuously slide down the chute, hence, as soon as a nail is driven into one head and it is removed, another head slides down to take its place.

## WASHINGTON CONTRACTOR-DEALERS DISCUSS GOODWIN PLAN.

**Samuel A. Chase and W. L. Goodwin Principal Speakers at Recent Meeting.**

There was held at Seattle on May 28 an informal meeting and dinner by members of the allied electrical interests of the state of Washington, under the auspices of the Washington State Association of Electrical Contractors and Dealers.

The day session, which was attended by contractors and dealers, principally, was devoted to discussion of problems in which that branch is specially concerned. William L. Goodwin, of the General Electric Co., Schenectady, N. Y., and Samuel A. Chase of the Supply Department of Westinghouse Electric & Manufacturing Co., Pittsburgh, who were making a tour of the Pacific Coast cities, were present and took part in the discussion. On this trip Mr. Goodwin and Mr. Chase visited Los Angeles, San Francisco, Portland, Seattle, Spokane and Salt Lake City, and also attended an enthusiastic electrical convention at Vancouver, B. C. Their tour over the Pacific Coast was to promote the organization of electrical contractors and dealers under the Goodwin plan, and to secure the co-operation of the electrical jobbers, central stations and manufacturers.

The principal session at the Seattle meeting followed a banquet at the Masonic Club. Representatives of all electrical interests were invited to attend this session. The 120 persons present included manufacturers, central-station men, jobbers, contractors and retail dealers. The meeting was presided over by W. N. Meacham, of the firm of Meacham & Babcock, electrical contractors.

After preliminary remarks, the chairman introduced Samuel A. Chase, whose subject was "Live and Help Live." He conceived that the greatest discord in the electrical industry arose from misunderstandings due to an incorrect interpretation of each other's language and motives. He believes that closer association will promote better acquaintance and consequently eliminate such misunderstandings.

Mr. Goodwin then gave one of his characteristic addresses, reiterating what he has often stated before and that is, that there should be effective co-ordination among the several branches of the electrical industry instead of a division into group organizations unfriendly to each other. In this connection he emphasized the interdependence of all the branches of the industry. The mistake group organizations make, he thought, was in assuming that they can arrange their economic conditions without regard to their relations with each other, and he portrayed a relationship in the industry wherein there would be recognized the same differential for services of equal value. He also stated that the lines of the contractor and dealer should be combined so that the demands of the consumer may be more fully met.

The need for accurate information from contractor-dealers on their cost of doing business, etc., was also pointed out. It was explained that when the contractor-dealer demands better discounts from the jobber or manufacturer he should be able to justify his case by the presentation of facts, which he is seldom able to do. He also described a campaign of education that will enable the manufacturer, jobber, central station, contractor and dealer to understand each other's problem as well as their own. The speaker took a stand against secret sessions and closed doors, and criticized those executive committees that make a practice of such meetings.

Mr. Goodwin was outspoken in disapproval of the municipal-ownership spirit so markedly developed in Seattle, believing this tendency would result in retarding future development of the electrical industry. In general, the widespread tendency in favor of government ownership was deplored as an economic error.

The meeting closed with appropriate remarks by J. J. Agutter, a Seattle contractor-dealer and vice-president of the Association, who stated that among the members of the local association this spirit of co-operation existed today to a greater extent than at any previous time. The annual convention of the association will be held in Seattle Sept. 11.

## NEW YORK STATE CONTRACTORS TO MEET JUNE 23-25.

The New York State Association of Electrical Contractors and Dealers will hold its annual convention at Saratoga Springs, N. Y., June 23, 24 and 25. An interesting and instructive program has been arranged for this meeting which will cover the relations between the various groups of the industry, all of which will be largely represented.

The committee in charge of the arrangements anticipates an attendance of not less than 600 and accommodations have also been provided for a large number of ladies and other guests. Several attractive entertainment features will also be provided.

Reservations may be made by applying to the secretary of the Association, J. P. Ryan, 26 Cortlandt street, New York City.

## RECORDS SHOW BUILDING BOOM WELL UNDER WAY.

According to recent newspaper notices, building contracts let for the week ending May 16, in the territory east of the Missouri and north of the Ohio rivers, amounted to a total of $59,748,953, with the Chicago district contributing almost one-half of this amount. Residential construction again leads, with the industrial and public works construction following closely. The total for the month of May, if the average for the first two weeks was maintained, greatly exceeds that of any previous year.

By districts the record for this week is as follows: New York, $10,173,211; Chicago, $27,440,000; Minneapolis, $1,141,000; Boston, $5,636,000; Philadelphia, $7,797,298; Pittsburgh, $7,561,444.

The total for April, $191,823,000, was the best April total on record.

# New Appliances

## Large Reclosing Breaker — Improved Talking Sign—Bell-Ringing Transformers—Sectional Battery-Charging Units

### New Type of Automatic Reclosing Circuit-Breaker.

The accompanying illustration shows a new circuit-breaker, known as type LRL, of 3000 and 4000-ampere capacities, recently put on the market by the Automatic Reclosing Circuit Breaker Co., Columbus, Ohio. This breaker is an electromagnetically operated circuit-breaker, having the following characteristics:

(a) Breaker is closed and held closed by means of an electromagnet.

(b) Opens automatically in case of overload, short-circuit or voltage failure.

(c) Remains open a definite time interval, regardless of cause of opening.

(d) In case breaker is opened by a short-circuit, the breaker makes no attempt to reclose while the short-circuit exists, but closes instantly upon the removal of short-circuit or overload.

The main contact brush is of a laminated butt-contact type. The studs are of laminated construction, the lower stud being slotted vertically and the upper stud being slotted horizontally. The main contact brush is protected from arcing by an auxiliary copper contact shunt and the final arc is formed

Automatic Reclosing Circuit-Breaker for Heavy-Duty Service.

on upper "graphalloy" contact tips. The upper arcing tip is supported on a pivoted support actuated by a strong compression spring so that the upper rear tip follows at a considerable distance in opening, thereby insuring good contact of the arcing tips until brush and auxiliary contact are separated from their respective contacts. The upper rear arcing tip is also pivoted directly on a bracket so that it is free to aline itself with the front contact in all positions.

Provision is made for adjusting the tension of the main brush by means of an eccentric bushing in the brush support.

This breaker is of very rugged construction and is particularly adapted to heavy-duty work, such as is met with in steel mills and street-railway service.

### Electric Talking-Sign Flasher Guaranteed for 5,000,000,000 Contacts Monthly.

Few people realize what a talking sign mechanism has to perform and its characteristics may therefore be of interest. The talking sign is so called because the letters or words appear consecutively and flash a continuous message. This effect is obtained by building the sign with the required number of lamps in close horizontal rows forming a bank of lamps, or lamp-letter field, so that the flasher by means of changing connections can cause any letter or figure to appear in light. By one method of arranging the circuits, each word by word appears until the sentence is complete, to be followed by another or series of messages following out a regular cycle of operation. The other makes the letters appear at one side and apparently float across the face of the sign and disappear at the opposite side. Ample time is given the onlooker to read the message and it never fails to hold his attention until it is effectively transmitted.

Frequently, a steady-burning sign has a space given over to a talking section so that the reader's attention is held by the message telling all about the product being advertised; the name and trademark are also drawn forcibly to his mind. Either or both of the two systems mentioned may be applied to one lamp-bank and by simply adding a new portion of message to the running one a "newspaper in the sky" is produced.

A new communicating device, known as Alpha-Omega, covers a system embodying the above principles of operation, but is very compact and adaptable for many uses for which the known talking signs were scarcely available because of their high first cost and expensive maintenance. Another characteristic of its two flashing methods is that the current is never broken by the aid of an insulating material but has a perfect metallic contact throughout. The intermittent flashing type is designated by Electro-Flash and the moving letter type by Travel-Flash.

The contact mechanism is the most important item and must be very well designed to give satisfactory work. For example, by the Travel-Flash the grand total of contacts made monthly exceeds 5,000,000,000 in a 5-hour daily run.

The remarkable performance of this flasher is controlled by only 1000 odd brushes used intensely for lighting as many lamps required for the text. The so-called dead material which was a big item with former types is entirely done away with by the new construction. One former style had as many as 55,000 contact brushes for the control of 3500 lamps, whereby about 1200 lamps were lighted for each text flash. The proportion between the active and dead material for lamps was ⅓ to ⅔, for brushes 3% to 97%, showing great inefficiency considering the expensive installation and operation, besides a limited amount of reading matter.

The new Alpha-Omega sign talks graphically and automatically any desired number of messages. Its word flashes are easily read and produce a most effective result. It is intended for publicity in general, as a medium for collective advertising, as an indicator or annunciator of news items, information, commands, etc. The machinery controlling the device, being light and small, requires but little floor space and can be placed anywhere near its lamp bank.

The text to be communicated is first prepared in the form of a stencil or record and then inserted in the machine. The preparation is simple and easily made with a special machine for this purpose and permits unlimited variation of the reading matter.

The Alpha-Omega has the distinction of being the first of its kind applicable for any foreign language, as Greek, Chinese, Russian, etc. Special types are also furnished for short fixed texts or business slogans, using half the usual number of lamps.

This new outfit consists of the following essential parts: (a) lamp bank; (b) flash controller; (c) connecting cables between (a) and (b).

Full particulars regarding this outfit may be obtained from the Alpha-Omega Electric Manufacturing Co., 241 Lafayette street, New York City.

### The New General Electric Bell-Ringing Transformers.

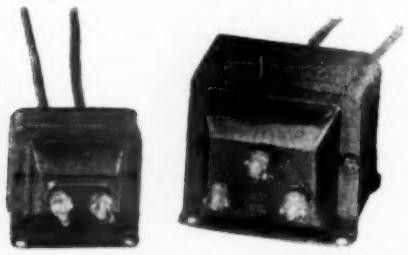
The complete new line of bell-ringing transformers just placed on the market by the General Electric Co., Schenectady, N. Y., comprises nine standard ratings, divided into two general classifications. The household type is intended for the ordinary signal systems found in residences. The heavy-duty types are for larger and more powerful signal systems in office buildings, hotels, apartment houses, mines, industrial plants, etc.

In the first class is the household size

transformer having ample capacity for all ordinary residential requirements, and built in three ratings as follows: For 110-volt, 50 to 140-cycle service; for 220-volt, 50 to 140-cycle service; for 110-volt, 25 to 49-cycle service.

The heavy-duty types are made in nominal rated capacities of 50 and 100 watts. Three secondary voltages are provided on these sizes, experience having shown this to be desirable on account of diversified requirements met with in this class of installations.

The transformer is designed for high electrical efficiency, the core losses being exceptionally low. Careful attention has been paid to avoiding any hum. All current-carrying parts are completely surrounded by steel, thus meeting underwriters' requirements, so that no additional steel box for enclosing the transformer is required in installation.



Typical Household and Heavy-Duty Types of Wayne Bell Ringers—The Full Line Includes Three of the Former and Six of the Latter Types.

In manufacture, these transformers receive the same attention as large transformers. Each one receives several careful inspections and complete tests before being packed. An inspection card, packed with each transformer, shows the connection diagram. The transformers are finished in green enamel, now standard for the Wayne transformer, and packed in attractively labeled individual cartons.

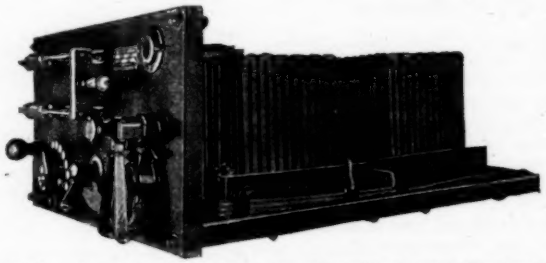
The parts for these transformers are also available for transformers for other purposes, such as toy transformers, special relay autotransformers, etc.

The complete line will be marketed through jobbers under the new G-E merchandising methods.

## Unipanel Sectional Units for Charging Batteries of Trucks.

Increasing use of electric industrial trucks and tractors is calling for more simple and reliable means for charging them, since these depend on the condition of the storage batteries with which they are equipped as the source of electric current. If the battery is not properly charged it rapidly deteriorates, thus not only becoming unreliable for service but shortening its life very decidedly. To meet the need for charging equipment for such service, the Automatic Electric Devices Co., 120 Opera place, Cincinnati, Ohio, has devoted itself for some five years to the development of special apparatus for this work, thus becoming recognized specialists in this line.

Probably its most highly developed product is what is known as the "Unipanel" standardized, interchangeable charging unit. It may be briefly described as a sectionalized rheostat and control unit for individual trucks or pairs of trucks or tractors, that may be readily assembled with similar units into a compact charging board for the entire fleet of these vehicles. Ordinarily, each Unipanel controls one battery, but by the addition of two pairs of switch clips and a movable switch blade, the unit can be made to serve two similar batteries in series. For lead batteries this special switch is not used, but for Edison batteries it is very commonly provided so as to permit charging the batteries of two trucks or tractors in series so as to make charging more efficient by cutting the rheostat losses in half and at the same time reducing the charging units to half.



Typical Unipanel Charging Unit That May Be Assembled with Similar Standardized Units in a Board for Charging Batteries of Tractors or Trucks.

Each Unipanel section includes a double-pole switch with cartridge fuses, a shunt-trip and underload circuit-breaker, a combination voltmeter and ammeter reading switch, and a 12-point rheostat for adjusting the charging current; there is also an indicating lamp and a card holder and, as already stated, when desired the special switch arrangement for connecting two batteries in series. The rheostat is provided with cast-iron grid resistors that are nickel-plated to prevent rusting. The grids are assembled between steel end plates and insulated with mica; it broken, they may be readily replaced without disturbing other grids. Contact buttons of the rheostat may also be easily replaced when worn.

All of the equipment mentioned, except the resistance grids, is mounted on a slate panel, which in all cases is 12 in. high by 22 in. wide and 1 in. thick. The grids are mounted on an angle-iron tray. All this Unipanel apparatus is assembled and connected up as a complete unit at the factory, ready for insertion into a standard angle-iron frame. These frames are of three sizes to meet varying requirements. The sections or Unipanels fit into them like superposed shelves or drawers of a filing cabinet. As many as five Unipanels may be placed in the largest frame, the other sizes accommodating four and three units, respectively. All the frames are 22 in. wide, the width of the standard unit. Any number of frames may be placed side by side to form a complete charging board for the installation. One instrument section or unit is included in the completed board. It carries an ammeter and a voltmeter and a lamp. The Unipanel units are connected at the back, through standardized busbars and meter connections, to the direct-current supply circuit and the meters. Each unit also has terminal lugs at the back which are connected to the charging or battery leads running to the truck or tractor. In very congested quarters a swinging meter bracket is provided at either the right or left side of the board.

The Unipanels are furnished in three sizes as to number and resistance of the resistor grids, but all have the same outside dimensions for the sake of interchangeability. By this arrangement it is possible to charge any 12 to 30-cell, 9 to 17-plate, lead battery by the size W L Unipanel, any of the smaller 20 to 40-cell Edison battery by size W E 4 Unipanel, and any of the larger 20 to 40-cell Edison battery by size W E 6 Unipanel. These three sizes provide for normal and boosting charges in each case and take care of the sizes and types of batteries commonly used with industrial tractors, locomotives and trucks. The units are made for 110 and also for 220-volt circuits, the latter being not so commonly called for, however.

From the foregoing condensed description it is evident that this equipment possesses unique features of design and construction. In operation also it has interesting features. As soon as the charging cable is connected to the battery the pilot lamp lights up, indicating that charging may begin. The resistance is first all cut in and the switch closed. With the meter switch turned to "In," the rheostat is adjusted until the proper charging current is obtained as shown on the ammeter.

If desired, the charging may be made automatic from this point on; this is done by providing what is known as a "Chargometer" on each truck or tractor. This is a special ampere-hour meter that is also of great value to the truck operator in enabling him to know the state of his battery at all times so as to prevent danger of exhaustion. The instrument has a pointer which on returning to zero, i. e., when the battery is again fully recharged, makes contact with a metallic pin, closing the shunt circuit of the circuit-breaker and cutting off the charge. The breaker also has an undercurrent relay to open it when the charging current drops to a predetermined value and this protects against reversal of current. Where desired, the Chargometer may be specially mounted on a spring suspension in a steel box, thus protecting it from the violent vibration and hard knocks of the truck or tractor on which it is used. This is known as the "Dreadnaught" type of Chargometer.

# Trade Activities

## Robbins & Myers to Greatly Expand Manufacturing Facilities—Roller-Smith Appoints St. Paul Representative

**Union Steam Pump Sales Co.**, a Michigan incorporation, has filed notice of organization to operate in New York, with a capital of $25,000. R. W. Friedman, 30 Church street, has been named to act as local representative.

**Walter A. Zelnicker Supply Co.**, St. Louis, Mo., is sending to the trade Bulletin No. 258 listing rails and accessories. These include relaying and new, all weights and sections, bars, crossings, frogs, switches, switch stands, ties, rail braces and spikes.

**M. G. Carthart** and **George B. Cross**, formerly connected with the Industrial Electrical Furnace Co., now represent the Detroit Electric Furnace Co. under the firm name of Carhart & Cross, with headquarters at 1401 Monadnock block, Chicago.

**McGill Manufacturing Co.**, Valparaiso, Ind., is distributing an attractive little folder, listing various types of Loxon lamp guards. The Loxon guard is a double duty device that eliminates the needless waste by saving incandescent lamps and enabling them to burn their full life.

**Albert & J. M. Anderson Manufacturing Co.**, 289-305 A street, Boston, Mass., has issued Bulletin No. 34 on A. B. C. plugs and receptacles. This is a special type of plug and receptacle for charging purposes chiefly although also serving admirably for convenient means of connecting other heavy circuits. Aside from the plugs and receptacles are also shown cords for use therewith and other appurtenances. An interesting one of these devices is the receptacle and plug with water-tight fittings. All of these plugs and receptacles are made for heavy and severe service.

**Roller-Smith Co.**, 233 Broadway, New York City, announces that it is now represented in St. Paul, Minn., by A. H. Savage, whose office is in the Pioneer building. Mr. Savage will handle the Roller-Smith lines of instruments, meters and circuit-breakers in the states of Minnesota and North Dakota and part of Wisconsin and South Dakota. Mr. Savage, prior to 1914, represented the Fort Wayne Electric Works in St. Paul and in 1914 he became a representative of the Wagner Electric Manufacturing Co. of St. Louis, he now being in charge of the St. Paul office of that concern. At the present time Mr. Savage is treasurer of the Dakota Light & Power Co., of Flandreau, S. D., and is also president of the South Dakota Power Association. He has been located in the Northwest for over 18 years and is one of the best known electrical men in that section.

**American Lava Co.**, Chattanooga, Tenn., is distributing the revised 1919 edition of a booklet on lava for mechanical and electrical purposes. It discusses the nature and physical properties, mechanical properties, electrical properties, uses and cost, composition lava, etc. This publication is profusely illustrated and contains much interesting information.

**Schaeffer & Budenberg Stock to be Sold.**—Announcement has been made by Francis P. Garvan, Alien Property Custodian, that a total of 1000 shares of the capital stock of the Schaeffer & Budenberg Manufacturing Co. will be offered for sale to the highest bidder at the principal office of the company, Berry and South Fifth streets, Brooklyn, N. Y., at an early date. The company manufactures gauge and recording instruments.

**Frank L. Perry** has engaged in publicity organization work for manufacturers of intricate electrical machinery, central stations, etc., with headquarters at 1118 Fidelity building, Baltimore, Md. Among the matters upon which definite announcement may be expected at an early date is a new line of heavy electrical machinery. This is to be an after-war product of a large eastern iron works, to take up the capacity of a greatly extended plant.

**Standard Electric & Elevator Manufacturing Co., Inc.**, Baltimore, Md., announces the opening of a New York office at 280 Broadway, New York City, with C. A. Yarrington as district manager. Mr. Yarrington has been affiliated with the company for about four years. Previous to that time he was with the export department of the Westinghouse Electric & Manufacturing Co., and later in the industrial department of the Consolidated Gas, Electric Light & Power Co., Baltimore, Md.

**Chicago Mica Co.**, Valparaiso, Ind., has issued its new catalog No. 26 on electrical insulating material. This is probably the most complete publication on mica insulations that has ever been prepared, the catalog comprising 48 pages and containing a mass of valuable data on this subject. Four tables are given of Micabond plate, followed by specific information on Micabond commutator segment insulation, Micabond cloth, paper, washers, tubing, commutator rings, etc. Twenty-one pages are devoted to details of Micabond commutator insulation for various types of traction and air brake motors. The remainder of the book is devoted to data on raw mica, uncut sheet mica, cut India and domestic mica, pure mica washers and discs, mica tubes, rods, fibre washers and dies, oil and varnished cloths, tapes, etc.

**Royal Electric Manufacturing Co.**, 600 East 40th street, Chicago, designer and manufacturer of high tension apparatus and electrical specialities, is sending out a number of new bulletins descriptive of some of its standard apparatus, including choke coils, disconnecting switches, air brake switches, etc. To meet the needs of customers requiring special equipment, the company maintains an engineering department fully equipped to design and a manufacturing department to develop apparatus to cover special conditions.

**Matthews Engineering Co.**, Sandusky, Ohio, manufacturer of automatic electric light systems for farms and small communities, has received orders amounting to $400,000, half of which will be exported to France and South America. Because of the orders just received the Matthews company will at once increase the working force at its factory from 126 to 300. It also plans to increase the floor space at its new factory from 40,000 to 60,000 sq. ft. Since the armistice was signed this company has received orders from the Federal Government for 50 large lighting plants, to be placed on new canal boats and mine sweepers operated by the Navy.

**Sprague Electric Works** of General Electric Co., New York, has issued Bulletin No. 48701-A dealing with Sprague electric dynamometers and superseding Bulletin 48701. This bulletin is devoted specially to the Sprague dynamometer as applied to laboratory and production testing of automobile, truck, tractor, airplane and marine gasoline and kerosene engines. A detailed description of this machine is given together with numerous views of the dynamometer in various testing laboratories. Another bulletin prepared by the company (Bulletin No. 48713) has for its subject the Sprague adjustable loop system and contains a description of the function, operation and construction of an overhead mechanical system for handling miscellaneous and bulk freight and materials in terminals sheds. This system is designated as the Sprague adjustable loop system, because the overhead track on which the hoisting and conveying machines are operated is in the form of a continuous unbroken loop, which is adjustable in length. The primary purpose of the system, applicable to terminal sheds for temporary storage or freight or materials before loading or after unloading from ships, barges or railroad cars, is to speed up the movement of freight in the shed, to reduce the cost of handling it, to utilize the shed space to the fullest extent, to speed up unloading and loading and to re-

lieve congestion at loading and unloading points. In some applications it is used directly for loading and unloading, in others only for handling in the terminal sheds.

**Beardslee Chandelier Manufacturing Co.,** Chicago, has just issued the fifth of the "S" series of Beardslee service catalogs. It is a 128-page book 10¼x13½ in. in size and shows more than 500 styles of chandeliers, any of which, in finishes given, can be shipped in 24 hours. For eleven years the Beardslee Chandelier Manufacturing Co. has continuously maintained 24-hour service on goods selected from its "S" line.

**Cole Storage Battery Co.,** Chicago, has completed negotiations for the purchase of a 80x181 ft. tract with improvements at 2435-39 Indiana avenue for a reported cash consideration of $30,000, subject to an incumbrance of $12,500. The Cole company plans to remodel the present building into a modern storage battery manufacturing building to contain about 13,000 sq. ft., at an expenditure of about $10,000 and will occupy it with its business.

**Hamilton & Hansell,** New York, reports the following sales of Rennerfelt electric furnaces: A 1000-lb. 400-kv-a. furnace to the Steel Alloys Co. of America, Bayway, Elizabeth, N. J., to be used for the reduction of tungsten-acid to metallic tungsten; and a 1000-lb., 200-kv-a. furnace to the British Nickel Co., Ottawa, Can., to be installed at its Deschene plant in Quebec, to be used for melting nickel. A 150-kv-a., single-phase pot furnace with complete equipment has been sold to the government of Netherlands, Colonial Department. This furnace will be erected at its experimental station in Batavia, Java, Dutch East Indies.

**Borden Co.,** Warren, Ohio, manufacturer of Beaver easy working die stocks and square-end pipe cutters, has just purchased an Oldsmobile roadster for its representative, George D. Clewell, who covers the New England States, Cleveland and Detroit. Mr. Clewell expects to work his entire territory with the car and in this manner will be able to keep in closer contact with the small towns and also be in a position to render more thorough co-operation with the jobbers. Charles A. Greene, Chicago representative for the company, has opened an office at Room 501, 549 West Washington boulevard, Chicago.

**Ilg Electric Ventilating Co.,** Chicago, as the culmination of ten years of employes' relation work, has established the system of allowing its employes to elect a member of its board of directors. This plan is similar to the law recently passed by the Massachusetts legislature, which was devised to stimulate co-operative effort between management and operatives in Massachusetts.

The officers of the Ilg company have already established a system whereby the workers have a large voice in the internal affairs of the concern. About two years ago the workers, through the department heads, formed a welfare committee, which at first dealt with such matters as come under the general heading of "welfare work." Its field was gradually expanded, until now it has been established as an advisory committee which is virtually a board of control so far as the internal policy of the plant is concerned. It is composed of ten workers from the plant, known as department heads, and five men from the office, embracing the secretary, vice-president, engineer, production expert and purchasing agent. When the company decided to build a new plant recently the board selected the plant and decided on the type of building and machinery. It passes on practically everything, including pay rolls and classifications of wages, and its members are being initiated into higher financing questions, such as unit production costs, depreciation and overhead charges. As a background for this is a profit sharing system which the Ilg company established about eight years ago, and was inaugurated with the idea of giving the employes a permanent interest in the company as a business proposition. The yearly salary of each employe was considered as his investment in the concern, and a yearly dividend is paid upon it, determined by the directors after they ascertain the year's profits. In addition, length of service is a factor, those having worked at least six months and less than two years receiving a basic profit sharing dividend. This is supplemented by a graded increment, 5% extra for those who have worked two years, 10% for three years, and so on up to 11 years' service, which gixes a 50% extra profit.

The company ascribes its remarkable development in largest measure to its co-operative system. During the war when labor turnover was at top notch, the Ilg company had practically none, its whole force remaining intact with the exception of about 2%. The system has stabilized its staff in the plant, which has meant increased efficiency, which in turn has resulted in greater output, lower cost of production, higher profits, and increased wage dividends to the workers.

**Page Steel & Wire Co.,** 30 Church street, New York City, has issued 60-page booklet on Armco iron rods and wire for electric welding and oxy-acetylene welding. These rods are prepared by a special process so as to be of exceptional purity, rivaling, if not exceeding, the material formerly largely imported from Sweden and Norway. For welding with metal electrodes it is necessary to have filling material of great purity, and these rods and wire have been found very well suited for this purpose. The booklet gives a great deal of technical information on the production, structure and purity of this material and has a very large number of illustrations showing it in use for various kinds of welding. A large mass of valuable information as well as tables of metric and other measures. A convenient feature is the inclusion of some dozen extra pages for memoranda.

**Robbins & Myers Co.,** Springfield, Ohio, has completed negotiations whereby it acquires the entire property of the James Leffel Water Wheel Co., adjoining its plants in Lagona, and thus is formed the nucleus for the largest exclusive electric fan and motor manufacturing plant in the world. Through this purchase the Robbins & Myers Co. acquires over five and one-half acres of ground, including 98,000 sq. ft. of factory floor space, and all buildings, including the boiler shop, erecting room, foundry, pattern room, woodworking shop and office building. Added to the present factory accommodations of the company, which include Plants One and Two in Lagona, the recently completed warehouse, and Plant Three in the Shuey factories building, this will give the firm approximately 500,000 sq. ft. of almost contiguous floor space, and over fourteen acres of ground. The company will also acquire the switching spurs now used by the Leffel company, giving tracks on two sides and switching facilities in the heart of the property.

Plant Nos. One and Two are so located as to provide for construction in between on the north and south, consuming all the James Leffel property, and making one continuous factory building eventually. The increased factory facilities will mean material expansion of the motor manufacturing business, development of new motors and particularly expansion of the new line of repulsion and induction motors.

Immediately following the vacating of the present factory and office buildings by the Leffel company, the Robbins & Myers Co. will assume possession and will increase its force from 3000 to over 5000. The present Leffel factory buildings will be used for the present, although the company has under contemplation entire reconstruction of the buildings, connecting with Plants One and Two which will provide adequate facilities to accommodate more than 6000 employes.

Originating with a small casting foundry in 1878, under the ownership of Chandler Robbins and James A. Myers, the Robbins & Myers Co. has experienced a remarkable growth and will indisputably become the world's largest exclusive manufacturer of electric fans and motors. In 1887, C. F. McGilvray, president of the company, and also president of the City Commission, joined the firm as superintendent. In 1898, with a force of barely more than 200, the firm entered the electrical field, manufacturing ceiling fans and later desk and bracket fans, and in the following year built its first power motors. In 1900 James A. Myers, H. E. Myers and C. F. McGilvray purchased the interest of Chandler Robbins and continued the firm as the Robbins & Myers Co. The purchase from John W. Bookwalter of the old rake factory in 1899 formed the nucleus for the present main plant, which was reconstructed in 1907. The complete destruction of the R. & M. foundry in 1914 resulted in the erection of Plant Two the following year. Plant Three in the Shueing building was acquired in 1918, and the new warehouse was also built last year. With the retirement in 1915 of H. E. Myers, the official personnel of the company became C. F. McGilvray, president; Wilbur J. Myers, vice-president, and Warren A. Myers, secretary. In 1917 H. E. Freeman joined the company as treasurer.

# Current News

## Weekly Record of Construction Activities—Conventions

### EASTERN STATES.

**Fair Haven, Vt.**—Tair Brothers Creamery Co. will install ice making machinery for the refrigeration of its entire creamery. The power requirements of this plant will be furnished by the Western Vermont Power & Light Co.

**Brockton, Mass.**—George E. Keith Co. has awarded a contract to Westcott & Mapes, 207 Orange street, New Haven, Conn., for the construction of a new one-story power house at its plant, about 60x75 ft., to provide for increased operations.

**Chelsea, Mass.**—Bureau of Yards and Docks, Navy Department, has taken bids for the proposed extension to the local heating plant and distribution system. The work will cost approximately $70,000. C. W. Parks is chief.

**Worcester, Mass.**—New England Power Co. will expend $1,000,000 this season in increasing its power and means of distribution. One of the main generating stations of the system is at Vernon, Vt. This station will be enlarged by the erection of a large building and the installation of water wheels and generators to give 15,000 hp. additional, to bring the capacity of the plant to 45,000 hp. Additional substations will be built. Another important work will be connecting the present system, which covers central and western Massachusetts and much of Connecticut and Rhode Island, with the metropolitan district of Boston by building a line to feed into and from the Edison company's stations.

**Brooklyn, N. Y.**—In connection with the construction of a new boat storage shed, the Bureau of Yards and Docks, Washington, D. C., is planning for the installation of two new electric traveling cranes.

**Brooklyn, N. Y.**—Brooklyn Rapid Transit Co. has been granted an order by Federal Judge Mayer authorizing the issuance of receiver's certificates for $20,000,000. Of this sum, it is proposed to utilize approximately $16,000,000 for the equipping of rapid transit lines, the remainder to provide for extensive improvements, etc., in the surface lines of the company.

**Massena, N. Y.**—St. Lawrence River Power Co. has filed application with the Public Service Commission for permission to acquire the capital stock of the St. Lawrence Transmission Co., Potsdam. It is set forth in the petition that the St. Lawrence River Power Co. is the owner of all of the 3260 acres of the stock of the St. Lawrence company, and that the sum of $2,260,265 has been advanced, used, for the most part, for the electric development at Colton, N. Y.

**Glens Falls, N. Y.**—The movement for the establishment of an ornamental lighting system in the business sections of the city and the city park which was given up during the beginning of the war was again taken up when Elmer J. West, vice-president of the Adirondack Electric Power Corp., submitted a plan to the Common Council and if the council accepts it the power company will stand the expenses of installing the equipment which will be about $10,000.

**Mt. Jewell, N. Y.**—Mt. Jewell Tannery Co. has petitioned for franchise to furnish light and power.

**Montauk, N. Y.**—Bureau of Yards and Docks, Navy Department, is taking bids for the construction of the proposed power house at the local Government site.

**New York, N. Y.**—Electric Cleaner Co., 575 Fifth avenue, has filed notice with the Secretary of State of the issuance of additional stock increasing its capital from $5000 to $1,540,000 to provide for expansion. The company manufactures vacuum cleaners, etc.

**New York, N. Y.**—New York Edison Co., 130 East 15th street, is having plans prepared for the construction of a two-story brick administration building, about 25x75 ft., to be located at Hester and Norfolk streets. William Whitehill, 32 Union Square, is architect.

**New York, N. Y.**—New York Edison Co. has recently completed negotiations for the purchase of property on Hester street for a new building. The company is planning for the erection of a new transformer station at 421-23 East Sixth street.

**New York, N. Y.**—New York Municipal Railway Corp. has had plans prepared for the erection of two new one-story structures at 420-22 Broadway. Fred P. Platt & Brothers, 1123 Broadway, are architects.

**New York, N. Y.**—Reimers Manufacturing Co., 517 West 45th street, manufacturer of electric heaters, etc., has leased property at 507-13 West 50th street, for new works.

**Niagara Falls, N. Y.**—Niagara Falls Power Co., Buffalo avenue, has filed plans for the construction of a new one-story gatehouse, about 75x158 ft., at its plant at the Canal Basin. Contract for the structure, which is estimated to cost about $30,000, has been awarded to the Read-Coddington Co., Portage road.

**Watertown, N. Y.**—Northern New York Utilities, Inc., has been granted permission by the Public Service Commission to issue refunding mortgage bonds for $200,000, and cumulative first preferred stock for $118,000, as well as common stock for $42,500.

**Bordentown, N. J.**—Public Service Corp. is planning for the commencement of work on the construction of the proposed electric power line to extend from Bordentown to the municipal waterworks. It is also planned to place into operation at an early date the two new electrically operated pumping units installed at this plant. The entire work is estimated to cost $15,000.

**Glenmore, N. J.**—Philadelphia & Reading Railroad, Reading Terminal, Philadelphia, Pa., has taken bids for the construction of a new one and two-story signal tower and battery house at Glenmore, N. J.

**Newark, N. J.**—Electrical Appliance Co., 164 Market street, has filed notice of organization to operate for the production of electrical appliances, etc. Bernard Lefkowitz heads the company.

**Newark, N. J.**—Standard Electric Manufacturing Co., 24 Scott street, has acquired a portion of the building at 126 South street and will establish a plant.

**Trenton, N. J.**—The City Commission has taken bids for electrical work in connection with the proposed building to be erected on North Warren street. The Electrifier Shop, Trenton, submitted the low bid at $1325. Other bidders are: Carr & Schultz, Trenton, $1495; and the Mercer Electrical Co., $1590.87.

**Trenton, N. J.**—Trenton and Mercer County Traction Corp. is planning for immediate work on the installation of a new conduit system on Lincoln avenue and other streets.

**Trenton, N. J.**—John A. Roebling Sons Co. will make extensions and alterations in its one-story drying oven works at its wire rope manufacturing plant.

**Carlisle, Pa.**—E. C. Beetem & Sons are taking bids for the construction of a one-story brick and steel power plant at their works, to provide for increased capacity. The structure will be about 46x46 ft. W. E. S. Dyer, Land Title building, Philadelphia, is architect for the company.

**Pittsburgh, Pa.**—Jones & Laughlin Steel Co. has had plans prepared for the construction of its new one-story boiler plant, to be located on Second avenue, near Bates street, the structure to cost about $6000. A building permit has been issued.

**Pittsburgh, Pa.**—Effective July 1, the Duquesne Light & Power Co. will place into operation a new schedule of rates, reducing the present cost of electric power service by approximately 20%.

**Sparrows Point, Md.**—United Railways & Electric Co., Continental building, Baltimore, has awarded a

contract to the Price Construction Co., Maryland Trust building, Baltimore, for the construction of a reinforced-concrete two-story signal tower at its local properties.

**Sparrows Point, Md.**—Bethlehem Steel Co. has awarded a contract to Gladfelter & Chambers, 932 West 36th street, Baltimore, for the construction of a new one-story brick pumping plant at its local works, about 50x80 ft.

**Clarksburg, W. Va.** — Lafayette Window Glass Co. desires prices on a 100-hp. boiler. Address Julien Coussin, president.

**Millvale, W. Va.**—Northern Virginia Power Co. will erect a power house, 33x50 and 50x57 ft. in dimensions.

**Spencer, W. Va.**—The city has had plans prepared for the construction of a one-story brick electric light plant, about 30x40 ft., to be used for municipal service. R. C. Wieland is mayor.

**Wheeling, W. Va.**—Benwood-McMechen Consolidated Water Co. will install two motor driven centrifugal pumps. S. G. Smith, receiver.

**Bridgewater, N. C.**—Southern Power Co., Charlotte, N. C., has recently completed arrangements for the acquirement of the Sydo hydroelectric development, and it is understood that plans are being arranged for the completion of the work, including the construction of power house, completion of dams, etc. It is understood that the project will involve an expenditure of about $400,000.

**Dublin, Ga.**—One of the important matters discussed at the merchants' meeting was the pressing need in Dublin for more electric power to run the industries that are demanding current. It was finally decided to appoint a committee from the merchants to meet with the Light and Water Commission for the purpose of asking that some relief from the present situation be granted.

**Bowling Green, Fla.**—The city will vote on $20,000 bonds for water plant and electric distributing system. Address the mayor.

**Leesburg, Fla.**—The city is understood to be having plans arranged for the construction of a new municipal electric light system. Bonds to the amount of $35,000 have been issued to provide for the proposed work.

**Port Orange, Fla.**—The city has voted to issue $9000 in bonds to construct electric light system. Address mayor.

## NORTH CENTRAL STATES.

**Bellefontaine, Ohio.**—An election will be held Aug. 12 for issuing bonds $110,000 for improving waterworks plant and installing meter system.

**Columbus, Ohio.**—Columbus Conveyor Co. plans the erection of a plant, 100x180 ft. in size.

**Lima, Ohio.**—Ohio Electric Co. will expend $200,000 immediately on new equipment and will erect within five years either at Indian Lake or Scotts Crossing a power plant to cost $2,000,000, capable of handling the light and power needs for this city for the next ten years.

### DATES AHEAD.

Electrical Supply Jobbers' Association. Annual convention, Hot Springs, Va., June 10, 11 and 12. Headquarters, The Homestead Hotel. Secretary, Franklin Overbagh, 411 South Clinton street, Chicago.

Tri-State Water and Light Association. Annual convention, Greenwood, S. C., June 17-19. Secretary-treasurer, W. F. Stieglitz, Columbia, S. C.

American Society of Mechanical Engineers. Spring meeting, Hotel Statler, Detroit, Mich., June 17-20. Secretary, Calvin W. Rice, 29 West 39th street, New York City.

American Institute of Chemical Engineers. Summer meeting, Boston, Mass., June 18-21. Secretary, Prof. J. C. Osien, Polytechnic Institute, Brooklyn, N. Y.

Illinois Association of Electrical Contractors and Dealers. Summer convention, Decatur, Ill., June 20-21. Secretary, W. J. Collins, 179 West Washington street, Chicago.

American Society for Testing Materials. Annual meeting, Atlantic City, N. J., June 24-27. Headquarters, Hotel Traymore. Secretary, University of Pensylvania.

American Institute of Electrical Engineers. Annual convention, Adirondacks, N. Y., June 24-27. Headquarters, Lake Placid Club. Secretary, F. L. Hutchinson, 33 West 39th street, New York.

National Association of Electrical Contractors and Dealers. Annual convention, Milwaukee, Wis., July 15, 16 and 17. General manager, William H. Morton, 110 West 40th street, New York City.

Ohio Electrical Light Association. Annual meeting, Cedar Point, Ohio, July 15-18. Headquarters, Breakers Hotel. Secretary, D. L. Gaskill, Greenville, Ohio.

International Association of Municipal Electricians. Annual convention, Chicago, Sept. 23-26. Secretary, Clarence R. George, Houston, Tex.

Association of Iron and Steel Electrical Engineers. Annual convention, St. Louis, Mo., September, 1919. Secretary, John F. Kelly, Empire building, Pittsburgh, Pa.

National Association of Electrical Inspectors. Annual meeting, Springfield, Mass., Oct. 13 and 14. Secretary, W. L. Smith, Concord, Mass.

Illuminating Engineering Society. Annual convention, Chicago, Ill., October. General secretary, Clarence L. Law, 29 West 39th street, New York City.

**Minerva, Ohio.**—An election on a $50,000 bond issue for the purpose of repairing and enlarging the municipal electric light plant carried.

**Oberlin, Ohio.**—A special election will be held to vote on the question of issuing $50,000 in bonds to erect a municipal plant for the distribution of light and power. Address city clerk.

**Brazil, Ind.**—Terre Haute, Indianapolis & Eastern Traction Co. was the only bidder for the contract for furnishing street lighting for the city of Brazil and decision in the matter of awarding the contract was withheld. A slight change was made in the bids for lights under the old contract, by replacing the arc lights with incandescent globes, which the company has expressed its willingness to do.

**Evansville, Ind.** — Louisville & Nashville Railroad Company has begun extensive improvements at Howell, Ind., a suburb of Evansville. An electric turntable will be completed within the next six weeks and an automatic coaling station will be built. A new roundhouse will be built later.

**Gary, Ind.** — Lighthouse Electric Co. has increased its capital stock from $10,000 to $20,000. Of this $12,000 will at once be expended in building an addition to the building occupied by the company at 570 Washington street and in doubling the space and facilities of the concern. A. B. Harris, president of the company.

**Hartford City, Ind.**—The south side plant of the American Window Glass Co. will be rebuilt this summer at a cost of $250,000. An additional line of five additional blowing machines will be added, six new flattening ovens and two new producers, as well as complete remodeling and enlargement of the plant.

**Indianapolis, Ind.**—E. G. Spink Co. will build three-story brick and stone apartment building, 70x170 ft., at 1733 North Meridian street. The company will also erect a three-story apartment building, 50x200 ft., at 1226 North Illinois street.

**Marion, Ind.**—Allmur Manufacturing Co. proposes to build a new plant on property recently acquired, at an estimated cost of $25,000.

**Delavan, Ill.** — Twenty-four hour service will be supplied by the Royal Light & Power Co., the company to build a 6600-volt transmission line from the new power house at San Jose to Delavan. The present power house of the company at Delavan to be used in cases of emergencies.

**Elgin, Ill.**—The Elgin Country Club will install a private electric lighting plant at a cost of $1000.

**Elizabethtown, Ill.**—A stock company is being formed here for the purpose of erecting and operating a light and power plant. A franchise has already been granted. Address E. F. Carter.

**Springfield, Ill.**—Plans are under way for the purchase and operation of the Springfield Gas, Light & Power Co. by the city. Springfield now has a municipal light plant which serves approximately one-third of the electric power consumed by the community. The municipal plant sells its current at six cents a kw-hr. The rate of the utilities company is 11 cents an hour. The corporation which owns the electric and power plant also owns the street railway system and there is a movement under way to purchase this utility when the company's franchise expires two years hence.

**Battle Creek, Mich.** — Advance Pump & Compressor Co. will build a machine shop, foundry and power house. C. A. Flenn, purchasing agent.

**Plainwell, Mich.**—Fire in the wheelhouse of the Consumers' Power Co.'s generating plant completely destroyed the plant and its equipment. Loss $25,000.

**Ironton, Minn.**—The village council has let contract for ornamental lights to the Western Electric Co., 114 North 3rd street, Minneapolis,

Minn. Address Theo. Grunsted, clerk.

**Red Wing, Minn.**—The City Council has been authorized to issue bonds for $350,000 to provide for the construction of a new municipal power and electric light plant, preliminary plans for which are now being prepared. S. T. Irvine is clerk.

**Wells, Minn.**—The city is preparing plans for a power house and electric distributing system.

**Janesville, Wis.** — In connection with the proposed construction of a two-story plant, to be used as an addition to its works, the Parker Pen Co. has had plans prepared for the erection of a new brick, steel, and concrete power plant for works operation. Estimated cost, $125,000.

**Malone, Wis.**—Malone Light & Power Co. has been organized by John L. Beau, Frank Clark and Christ Pickart. The capital stock is given at $25,000.

**Sheboygan, Wis.**—Honold Electric Co. will build a one-story addition, 50x80 ft., for the repair and maintenance of storage batteries and automotive electrical devices.

**Newton, Iowa.**—Des Moines Electric Co. will furnish electric energy to Newton at 2.42 cents per kw-hr. for eight years. Plans are being made to erect a $90,000 plant at Newton in the future.

**Carthage, Mo.**—The installation of cluster lights on all paved streets is contemplated. J. B. Lloyd, city clerk.

**Fulton, Mo.**—A special election will be held on June 17 to vote on a $50,000 bond issue for installing a municipal telephone system. The bonds are to bear 5% interest.

**Sikeston, Mo.**—The city is understood to be planning for the construction of an electric lighting system, to be used for municipal service. Plans are under consideration for a bond issue for $75,000, to provide for the cost of the proposed work.

**Springfield, Mo.**—Springfield Gas & Electric Co. have made plans for the construction of a new power generating plant to be erected at a cost of $750,000.

**Alexander, Kans.**—Plans are being made to extend the electric lines from McCracken to furnish current for Alexander.

**Chanute, Kans.**—A special election will be held in the near future to vote on a $60,000 bond issue for the extension of the city electric service.

**Herndon, Kans.**—Additional street lights are to be installed by the City Council.

**Hutchinson, Kans.**—It is very probable that an electric power transmission line will shortly be built from Hutchinson to Partridge, Arlington, Langdon and Turon, supplying those towns with light and power. Delegations from the city councils and commercial bodies of the four towns were here in consultation with J. F. Springfield, manager of the United Water, Gas & Electric Co.

**Larned, Kans.**—Pawnee Power & Water Co. has begun work on the line out of Burdette to connect with Burdette. Four or five additional towns along the line have made application for having the power brought to their communities.

**McPherson, Kans.**—A possibility exists that McPherson will have a 5000-hp. plant. The Central Kansas Power Co. is going to build a large power plant on the western end of its transmission system. R. O. Keys represents the company.

**Mulvane, Kans.**—Henrici & Lowry, engineers, 222 Commerce building, Kansas City, Mo., have been chosen to make plans for a new electric light plant.

**Oswego, Kans.**—Engineer Moore has been chosen to prepare at once plans for the new municipal electric light and power plant. $50,000 bonds have been voted for the plant. The new plant will be started as soon as practicable and completed by Nov. 1 if possible.

**Rossville, Kans.**—The electric light company is making plans for the construction of a new building for its plant.

**Omaha, Neb.**—Commissioner Zimman has proposed to the Council that 800 gas lamps be replaced with electric lights. This proposal was offered in spite of the fact that the city owns the gas lighting equipment and maintains it. A list of 354 replacements has already been worked out and the total number will be brought up to $800.

**West Point, Neb.**—Election will be called soon to vote $300,000 in bonds for water power plant.

**Sioux Falls, S. D.**—Excavations have been completed and the forms set for the foundation of the $300,000 addition to Northern States Power Co.'s power plant at Sioux Falls. A new 3000-kw. generator will be installed.

## SOUTH CENTRAL STATES.

**Louisville, Ky.**—Kentucky Wagon Manufacturing Co. will expend $100,000 in the construction of a two-story steel and brick building with modern equipment and machinery. Address R. V. Board, president.

**Anniston, Ala.**—A deal has just been concluded here whereby the Southern Munitions Co., a subsidiary of the Alabama Power Co., purchased all of the property known as the car works plant, and its early operation to full capacity is an immediate industrial prospect for Anniston.

**Union Springs, Ala.**—The city has voted $10,000 bonds to improve water and electric light plant and purchase fire department truck. Address the mayor.

**Blytheville, Ark.**—Missouri Southeastern Utilities Co. will establish central power plant to furnish electricity for towns in southeast Missouri and northeast Arkansas.

**Ft. Smith, Ark.**—Voluntary bankruptcy proceedings have been filed in the United States District court at Harrison, Ark., by the Harrison Gas & Electric Co.

**Little Rock, Ark.**—Arkansas Hydro-Electric Development Co., through its engineers, Dickinson & Watkins, filed with Secretary of State Terral the engineers' estimate of cost and a plat showing lands required for the proposed development of the power dam site near Heber Springs. The plans call for a 15,000-kw. installation. The estimated cost totals $873,950.

**Little Rock, Ark.**—Contract will be awarded soon for drilling test holes to diagram the geological formation of the big dam site on the Little Red River. A hydroelectric generating plant, including a large concrete dam, spillway, power house and transmission lines, are called for in the plans and specifications. The estimated cost of the first unit is about $300,000. With all units constructed that the plant provides for, the total cost will be about $1,000,000.

**Marianna, Ark.**—Arkansas Light & Power Co. has been directed to replace several parts of machinery that are defective; to duplicate certain units and thoroughly overhaul and put into effective operation condition the entire plant; to install a new boiler feed pump of 250 hp. capacity; repair the switchboard and to properly connect the meters and to maintain at all times ample number of street lights.

**Oklona, Ark.**—An electric light plant will be installed on the Antone river, to be operated with water power and to furnish electric current for Oklona and large plantations in the vicinity. R. H. Andrews, owner of the local telephone exchange, is promoting the enterprise.

**Texarkana, Ark.** — Southwestern Gas & Electric Co. is planning for the immediate rebuilding of its carhouse and shops recently destroyed by fire, with loss estimated at approximately $150,000.

**Garber, Okla.**—Engineers Black & Veatch, 507 Interstate Bank building, Kansas City, Mo., have prepared plans for light and water system.

**Hominy, Okla.**—The city will install an electric light system. Address the mayor.

**Newkirk, Okla.**—Election to vote $185,000 in bonds for a new light plant, new well, extension of water and light systems, carried.

**Oklahoma City, Okla.**—One 100-cp. electric light is to be installed every 150 ft. for a distance of two miles along the diversion dam and at other points of the city water supply for night work and emergency use.

**Perry, Okla.**—Black & Veatch, 507 Interstate building, Kansas City, Mo., are making plans and estimates for waterworks and electrical improvements.

**Tahlequah, Okla.**—Two hundred thousand dollars in bonds have been voted for a municipal power and electric plant. Plans show that the plant will be one of the best in the state and will be able to furnish power and light to other cities if they want it. The fall of the river at that place is sufficient to generate all the power that is needed at a minimum of cost.

**Weleetka, Okla.**—The construction of a power plant on the Canadian river is contemplated.

**Bloomburg, Tex.**—The city com-

missioners will install an electric light plant.

**Brownsville, Tex.**—Contract for a 500-kw. turbogenerator to be installed in the municipal electric power plant was awarded to the Southwestern General Electric Co., Dallas. Condensing apparatus for the new unit has not been contracted for. This will cost about $10,000.

**Dallas, Tex.**—Dallas Power & Light Co. has filed an application with the city for permission to issue $1,500,000 in preferred stock and $6,000,000 in bonds for refinancing purposes, in order to take care of first mortgage when due, and to make necessary extensions and improvements.

**Dallas, Tex.**—An application has been filed with the city of Dallas by the Dallas Power & Light Co. for permission to issue $1,150,000 in preferred stock and $6,000,000 in bonds for refinancing purposes. It is desired to refinance in order to take care of the first mortgage when necessary and to make needed improvements and extensions.

**Donna, Tex.**—Permission has been granted to the Donna Light, Ice & Power Co. of Donna to increase its capital stock from $5000 to $10,300. The company is making plans for extensive improvements.

**Ennis, Tex.**—The installation of a municipal lighting plant has been proposed by Mayor White.

**Wichita Falls, Tex.**—The Chamber of Commerce of Wichita Falls has under consideration the proposition of constructing an interurban railway line between this place and Burkburnett. The matter was presented to the board of directors by W. L. Sonntag, a railroad contractor of Evansville, Ind. No power plant would be constructed, the line obtaining its operating power from the Texas Light & Power Co.

## WESTERN STATES.

**Dillon, Mont.**—Plans are under consideration for the installation of a street lighting system and paving the streets. The cost of the work is about $80,000.

**Pine Bluffs, Wyo.**—A bond issue of $40,000 has been voted for extending the water mains and sewers, and also enlarging the light plant.

**Grover, Colo.**—Citizens have voted $34,000 in bonds for water works and an electric light plant.

**Santa Fe, N. Mex.**—The council has appointed a committee to call on the Santa Fe Water & Light Co. with reference to purchasing its plant and to name an engineer for appraising the plant.

**Seattle, Wash.**—As a result of his visit to the Cedar Lake electric power plant, Councilman Oliver T. Erickson will lay before the Utilities Committee a resolution recommending the addition of another 10,000-hp. unit to the plant.

**Seattle, Wash.**—The City Council has authorized the Board of Public Works to prepare plans for the installation of an additional hydroelectric unit of 10,000 hp. at the Cedar Lake municipal power plant.

**North Bend, Ore.**—Buehner Lumber Co. wishes particulars concerning 500 to 750-kw. a. c. generator set; 60-cycle, three-phase, 440 volts. The company can use low or high-pressure turbine, but prefers a surface condenser.

**Grace, Idaho.**—An election on the bond issue to purchase the Grace Lighting System carried. The bond issue was for $15,000 and will pay for the lighting system.

**Salt Lake City, Utah.**—The City Council contemplates improvements in the waterworks supply lines, power plants, etc., to cost about $1,000,000.

**Phoenix, Ariz.**—A transmission line 70 miles long will be constructed to connect the generating station of the Pacific Gas & Electric Co. of Phoenix and the Arizona Power Co. of Prescott. The demand for power in the district has increased and it is expected that additional power facilities will hasten development.

**Yuma, Ariz.**—Southern Sierra Power Co. of California has entered into a contract with Sanguinetti & Ewing of Yuma for the extension of its electric power transmission system to the irrigated districts of this region for the purpose of using the power to operate pumping plants and certain types of farm equipment. The Yuma Gas, Light & Power Co. opposed the entry of the Southern Sierra Power Co. to this field and it appealed to the State Corporation Commission of Arizona to issue an order against the power lines of the California corporation entering this state. The Corporation Commission, however, refused to take any part in the fight between the two companies and the proposed power lines will be built, it is announced. About 20,000 acres of land will be placed in irrigation, in addition to the area already watered from pumping plants.

**San Francisco, Cal.**—Pacific Gas & Electric Co. plans for the early resumption of work in connection with the establishment of a hydroelectric power plant in the Big Bend of the Pit river, with extensive power development in this district. The project is estimated to cost in excess of $12,000,000.

## PROPOSALS

**Motor.**—Bids will be received at Beggs, Okla., on June 18 for one mechanical filter plant, capacity 500,000 gal. per day, to be erected at the waterworks plant; also for one 7x8 triplex pump and 25-hp. electric motor. Address W. K. Enoch, town clerk.

**Generator and Engine.**—Bids will be received at Oxford, Ohio, on June 14 by the Board of Trustees of Miami University for an engine and generator, together with switchboard changes and wiring and piping connections, for the central heating and lighting plant of the university. Walter G. Franz, consulting engineer, Cincinnati, Ohio, has prepared plans.

**Boilers.**—The Treasury Department, Supervising Architect's Office, Washington, D. C., will receive bids until 3 p. m. June 16 for four new water-tube boilers, etc., in the United States custom house and post office at Cincinnati, Ohio, in accordance with specifications and drawing, copies of which may be had at this office, or at the office of the custodian, Cincinnati, Ohio, in the discretion of the Supervising Architect. James A. Wetmore, acting supervising architect.

**Boilers, Generators, Stokers, Etc.**—Bids will be received until June 18 at Kansas City, Kans., on the following alternate bids on one 10,000 or one 6000-kw. turbogenerating unit, two 600-hp. water-tube boilers and automatic stokers, one turbine driven boiler feed pump, one brick and concrete transformer house, one substation complete with poles, coffers and material for new lines. A. H. Strickland, purchasing agent. William Barclay, engineer.

**Electrical Equipment.**—Bids will be received until 2 p. m. June 10 by Ray L. Gamble, state architect, Topeka, Kans., for the following electrical equipment for the Normal School at Hays, Kans.: One 250-hp. automatic horizontal side crank engine, 270 r.p.m., 100 lb. pressure, four valve or uniform type; one 150-kv-a., 200-volt, 60-cycle, three-phase direct current generator, marble 1½ in.; 60 ft. high switchboard; 570 ft. 400,000 circular mills cable, two 25-kw. and two 15-kw., 220 to 100-volt transformers, automatic lubricating system, valves, etc. A certified check of 5% is required on each bid.

**Turbogenerator Sets and Switchboard.**—Sealed proposals in duplicate, endorsed bids for furnishing and erecting one 25 and one 15-kw. turbogenerator sets and switchboard for Mt. Royal Pumping Station, will be received at the office of the City Register, City Hall, Baltimore, until 12 o'clock, June 11. Specifications may be obtained at the office of the Water Engineer, City Hall, Baltimore, Md. A charge of $5 will be made for each set of specifications, this amount will be refunded upon the return of the specifications in good condition before June 30. A certified check of the bidder on a clearing-house bank, made payable to the Mayor and City Council of Baltimore, Md., for the sum of $500 will be required with each bid.

## INCORPORATIONS

**New York, N. Y.**—Webb Electric Furnace Corp. Capital, $20,000. To manufacture electrically operated furnaces and kindred equipment. Incorporators: J. G. Webb, H. T. and E. G. Gerdes, 30 Church street.

**New York, N. Y.**—Aladdin Lamp Works, Inc. Capital, $15,000. To manufacture electrical equipment. Incorporators: R. S. and J. G. Turnbull, and L. Castelli, 334 East 78th street.

**Athens, Ohio.**—Hocking Light & Power Co. has incorporated with a capital of $5000 by John E. Dolman.

# Personal

## O. M. Rau Appointed Gen. Mgr. Dodge & Zimmerman—A. W. Erdman Joins Pratt & Whitney Company—Changes

E. T. CAUSER recently resigned as works manager of the R. D. Nuttall Co., Pittsburgh, Pa.

F. D. NIMS, vice-president and general manager of the Washington Coast Utilities, Seattle, is making a business trip to Boston and other eastern cities.

W. J. CRAWFORD has been appointed manager of the power apparatus department of the F. Bissell Co., jobber and manufacturer of electrical supplies and machinery, Toledo, Ohio.

H. L. GARBUTT, formerly manager of the line materials section of the supply department, Westinghouse Electric & Manufacturing Co., has been made local supply manager of that company in San Francisco.

DAVID MCNAUGHTON has opened an office at 528 Lincoln Life building, Fort Wayne, Ind., where he will specialize in report and rate investigations of electric light and power companies, illuminating surveys, valuations and industrial engineering.

V. MCDANIEL, for many years superintendent of the Rogers Light & Power Co., Rogers, Ark., has accepted the position of superintendent of the Fayetteville Gas & Electric Co., Fayetteville, Ark. He will be succeeded by his son, Oscar McDaniel, as manager of the local company.

A. L. KEMPSTER, manager of the Seattle division, Puget Sound Traction, Light & Power Co., has gone to New York City where he will assist in the solution of the transportation problems of the Interborough Rapid Transit System. This corporation, which is the largest transportation company in the United States, was placed in receivers' hands on March 21, 1919 by the United States District Court.

COL. DOUGLAS I. MCKAY has been elected president of the Pulverized Fuel Equipment Corp., New York, succeeding John E. Muhlfeld, who retires to return to consulting engineering practice. Since July, 1917, Colonel McKay has been engaged in war work, first being commissioned a major in the Ordnance Reserve Corps, in charge of the raw materials branch of the Gun Division, where he purchased all raw and semi-finished materials. In January, 1918, he was promoted to the rank of lieutenant-colonel of the National Army and appointed assistant director of purchase and supply. He was subsequently promoted to colonel. He was graduated from West Point, and spent three years in the army, resigning to become deputy chief of the aqueduct police. He was later appointed police commissioner of New York, and then became assistant to the president of J. G. White & Co., Inc., two years later being elected vice-president and director.

J. W. BRUSSEL, formerly superintendent of the Wright-Martin Aircraft Corp., Long Island City, has become factory manager of the Dyneto Electric Corp., Syracuse, N. Y.

CHARLES EISLER, for five years associated with the Westinghouse Lamp Co., Bloomfield, N. Y., in the capacity of chief designer and engineer in charge of the equipment, designing and development department, is now superintendent of the equipment, designing and development department of the Save Electric Corp., Brooklyn, N. Y.

CHARLES H. ELLIOTT, after seven years of service as assistant superintendent of the blast furnace and steel plant of the Youngstown Sheet & Tube Co., Youngstown, Ohio, has resigned to become affiliated with the Weirton Steel Co., Weirton, W. Va.

LANGDON S. SIMONS, who recently received his discharge as a captain in the United States Army, is now manager of the Boston office of the Reliance Electric & Engineering Co., with headquarters at 10 High street.

RAYMOND W. FROST, recently of the Technical Board of the American Expeditionary Forces in France, has been appointed assistant chief engineer of the Thomson-Houston Co. (General Electric Co.) of France, with office located at 10 Rue de Lordre, Paris. At various times Mr. Frost has been employed as engineer by the Pacific Light & Power Corp., Los Angeles, Cal.; Sanderson & Porter, New York; the Dutch-Shell Oil Co., San Francisco, Cal.; Balfour-Guthrie Co., San Francisco, Cal., and the Electric Bond & Share Co., New York.

LIEUT. COL. A. W. ERDMAN has been appointed general manager of the small tools department of the Pratt & Whitney Co., Hartford, Conn. Mr. Erdman received his commission as major in the inspection division of ordnance in June, 1917, and was promoted to the rank of lieutenant colonel in January, 1918, which rank he held until he was honorably discharged in December, 1918. He was graduated from Stevens Institute of Technology with the degree of Mechanical Engineer. From 1901 to 1909 he served as superintendent of mechanical engineering with the Randolph Clowes Co., Waterbury, Conn., and during the two following years pursued personal research and experimental work. During this period he developed a compensating device on the Lewis range finder, of which the Government used over 300 for coast artillery defense purposes. From 1911 to 1917 Mr. Erdman was assistant mechanical superintendent with the General Electric Co., and for the past two years has been engaged in the general supervision of the manufacture of ordnance material in that company's plants.

L. A. WEATHERWAX, formerly connected with the Hendrickson Construction Co., Seattle, has affiliated himself with the Stone & Webster organization on hydroelectric work at Fresno, Cal.

E. C. RYAN, formerly connected with the New York office of the Electric Controller & Manufacturing Co., has been appointed manager of the Chicago branch, with headquarters in the Monadnock Block.

IRVIN E. BROOKE, until recently connected with the Pensacola Shipbuilding Co. as assistant to the naval architect and formerly electrical engineer for the Arnold Co., has opened an office as consulting engineer at 807 Stock Exchange building, Chicago, for the practice of general engineering work. Mr. Brooke was formerly in charge of mechanical work in the city engineer's office, and prior to that time was on the engineering staff of the Commonwealth Edison Co. He is an associate member of the American Institute of Electrical Engineers.

O. M. RAU, formerly general manager of the Commonwealth Power Co., Milwaukee, Wis., and for many years previous to that connection the electrical engineer of the Milwaukee Electric Railway & Light Co., is now a resident of Philadelphia, having been appointed general manager of Dodge & Zimmerman, Inc., Philadelphia, owner of public utilities. His wide experience in that field will render his services invaluable in his new appointment. Mr. Rau is well known in Wisconsin, having for many years been a prominent member of the Wisconsin Electrical Association.

DR. WILLIAM MCCLELLAN, who recently resigned as dean of the Wharton School of Finance and Commerce of the University of Pensylvania, is now vice-president of the Cleveland Electric Illuminating Co. Dr. McClellan is a graduate of the University of Pennsylvania and he possesses technical experience that covers many phases of the work. He was at one time engineer in charge of construction of the Philadelphia Rapid Transit Co., later becoming supervising engineer with Westinghouse, Church, Kerr & Co. He was also a member of the firm of Campion & McClellan, and chief of the division of light, heat and power of the Public Service Commission for the Second District of New York.

### OBITUARY.

NILES O. BRETZ, a member of the inspection corps of the Philadelphia Fire Underwriters' Association, serving under Washington Devereux, chief of electrical department, died recently. The late Mr. Bretz was also a member of the National Association of Electrical Inspectors.

# Financial News

## Annual Report of Northern States Power Co.

The annual report of Northern States Power Co. just issued for the year 1918 shows that the aggregate gross earnings of the company increased 17.31% over 1917, and net earnings increased 4.52%. During the first eight months of the year net earnings showed a decrease, notwithstanding certain increases in rates which had become effective about Jan. 1, 1918. Additional increases became necessary, and were put into effect in July and October, 1918. Since then operating results have improved. Approximately two-fifths of the increase in gross earnings may be considered the result of increased rates.

The earnings statement for 1918 compared with 1917 is as follows:

| | 1918. | 1917. |
|---|---|---|
| Gross earnings ... | $8,392,664.40 | $7,154,508.89 |
| Net earnings ..... | 3,542,974.06 | 3,389,780.50 |
| Fixed charges .... | 1,922,713.64 | 1,709,837.74 |
| Balance ..... | 1,620,260.42 | 1,679,942.76 |
| Preferred dividends | 1,036,915.32 | 916,011.05 |
| Balance available for amortization, depreciation and common dividends | 583,345.10 | 763,931.71 |

President H. M. Byllesby says in the report:

"The marked growth of the company's business continues. War-time activities have benefited it but moderately. In fact, certain important sections of the territory served by the company, notably Minneapolis and St. Paul, would probably have shown a greater increase in business under more normal conditions.

"In common with all labor-employing institutions, the company has been confronted with the necessarily large increase in rate of pay, which, together with the universarily increased cost of all items of operation and taxes, has been only partly compensated for by an increase in rates.

"No dividends were paid on the common stock of the company during the year under review. The entire balance of net earnings after payment of preferred dividends was set aside for depreciation, reserves and amortization.

"The territory served by the company is extremely prosperous, and the outlook for new business is excellent. Judging from the results of the first quarter, the year 1919 promises to show results more commensurate to the volume of business and the excellence of the service than has recently been the case.

"All of your properties have been fully maintained in accordance with the high standard of operating efficiency and physical upkeep established by your management."

One hundred and two miles of long distance transmission line was built during the year to connect 22 additional communities and improve the service. Forty thousand horsepower additional steam generating capacity is now under way, the major part of which is being installed at the Riverside steam station, Minneapolis, and will soon be ready for operation.

Nearly $3,000,000 will be expended for new construction during 1919, a large part of which capital it is expected will be raised locally. During 1918, $1,874,800 of the company's preferred stock was sold to 3792 local investors.

## Cutler-Hammer Issues Stock.

William A. Read & Co., Chicago, is offering $1,500,000 7% cumulative preferred stock of the Cutler-Hammer Manufacturing Co. at 102½ and accrued dividends. This stock is redeemable as a whole, or in part by lot, at 110 and accrued dividend, on three months' notice. Dividends are payable quarterly, March, June, September and December 1, and are exempt from the normal Federal income tax and from the state of Wisconsin income tax. A sinking fund is provided, comprising 10% of the company's annual net profits after payment of preferred stock dividends, beginning with the earnings for the fiscal year ending Dec. 31, 1920, for the redemption of the preferred stock at the market up to 110 and accrued dividends, or, if not obtainable, for redemption by lot at that price.

## Potomac Electric Power Offering.

The Potomac Electric Power Co. has sold an adidtional block of $1,500,000 of its general mortgage 6% bonds to the National City Co. and the Harris Trust & Savings Bank. The company does the entire commercial electric lighting and power business in the city of Washington, D. C., and adjoining communities. During the past 15 years the gross and net earnings of the company have more than tripled and net earnings for the year ended April 30, 1919, were $1,335,862.

## Middle West Utilities Note Issue.

A. B. Leach & Co., Inc., Chicago, has purchased $1,500,000 five-year 7% convertible gold notes of the Middle West Utilities Co. and is offering these for public sale. They are dated March 1, 1919, and mature March 1, 1924. The notes are in denominations of $1,000, $500 and $100 and their price is 97 and interest, the yield at this price being 7.75%. They are a direct obligation of the Middle West Utilities Co. and are further secured by collateral consisting of preferred stock of certain public utility corporations controlled by the Middle West company and common stock of the company in the proportion of $1500 par value of stock for each $1000 of notes. At the option of the holder, any notes may be converted at any time before maturity, or if notes are called for redemption before maturity then at any time before the period of 30 days immediately preceding the redemption date, for certain preferred stocks of subsidiary companies and a certain proportion of common stock of the Middle West Utilities Co. to the extent of $1500 par value of stock for each $1000 note. The Middle West Utilities Co. through its subsidiaries operates in the following 15 states: Illinois, Indiana, Kentucky, Maine, Michigan, Missouri, Nebraska, New Hampshire, New York, Oklahoma, Tennessee, Texas, Vermont, Virginia and Wisconsin, and serves an aggregate population of 1,272,250.

## Wisconsin Valley Electric Increases Capital.

At a meeting of the stockholders of the Wisconsin Valley Electric Co. held recently a resolution was adopted increasing the capital stock of the company from $800,000 to $2,000,000, the stock to be divided into two classes. One class will be common stock, to the amount of $1,200,000, total authorized issue, and the other class to be 7% preferred stock, dividends payable semi-annually, the amount of such preferred stock authorized to be $800,000.

The stockholders further authorized the immediate sale of $250,000.00 par value of the 7% preferred stock. This stock to be sold to customers of the company and the amount which any customer of the company will be permitted to purchase will probably be limited by the board of directors to a reasonable amount. As soon as the necessary authority has been obtained from the secretary of state, the company will issue a statement to its customers stating the exact terms and conditions upon which this stock can be purchased. The officials of the company state that the 7% stock will undoubtedly be offered to customers on a deferred payment plan similar to the plan adopted by the Government in the sale of Liberty Bonds.

The security issues of the company now stand as follows: Common stock, authorized $1,200,000, outstanding $800,000, preferred stock, authorized $800,000, outstanding none; bonds (Wisconsin Valley Electric Co.) authorized $15,000,000, outstanding $925,000.

The company has never issued any stock dividends and all the property of the company stands on its books at exact costs.

While no immediate improvements or development of property has been authorized, it is probable the increase of capital was made with that object in view. The company has several projects in contemplation which are of considerable magnitude and which will probably be carried out in the near future.

## Bay State Lines Sold.

The Bay State Street Railway Co., which operates in 90 cities and towns in eastern and southeastern Massachusetts and extends into New Hampshire and Rhode Island, was sold at auction recently by order of the Federal Court, under the reorganization plan by which the property is eventually to be in the hands of the Eastern Massachusetts Railway Co. and be managed by five public trustees provided for by a special act of the legislature.

The purchaser was Arthur I. Glidden, representing Lee, Higginson & Co. of Boston, reorganization managers for the Bay State company, and the price was $3,600,000, subject to the taking over of various obligations, including those of the Bay State receivership and mortgages of the Boston & Northern Co. and the Old Colony Street Railway Co.

## Duquesne Light Co. Reports for Nine Months.

The Duquesne Light Co. has issued a consolidated statement for the nine months ended Dec. 31, 1918, the fiscal year having been changed to correspond with the calendar year. The income account for the nine months period compares with the previous years ended March 31 as follows:

| | 9 mos. ending Dec. 31, 1918. | Years ended Mar. 31 1917. | 1916. |
|---|---|---|---|
| Gross ..... | $8,737,717 | $9,842,394 | $7,310,704 |
| Net after tax. | 3,330,461 | 2,709,582 | 2,990,261 |
| Other income. | 46,423 | 102,571 | 112,246 |
| Total income. | 3,376,884 | 2,812,153 | 3,102,507 |
| Surplus after charges, depreciation, etc. ..... | 1,575,667 | 1,644,296 | 2,163,327 |
| Preferred div. | 309,878 | 414,503 | 397,466 |
| Common div.. | 1,139,130 | 1,457,969 | 1,456,172 |
| Surplus ..... | 126,659 | *228,176 | 314,689 |

*Deficit.

## Dividends.

Standard Gas & Electric Co. has declared a quarterly dividend of 2% on preferred stock, payable June 14 to stock of record May 31.

Columbus Electric Co. has declared a semi-annual dividend of $3 per share, payable July 1 to stock of record June 18.

Pennsylvania Water Power Co. has declared a quarterly dividend of 1½%, payable July 1 to stock of record June 19.

A quarterly dividend of $2 per share has been declared by the Chicago Telephone Co., payable June 30 to stock of record June 28.

Worthington Pump & Machinery Co. has declared a quarterly dividend of 1¾% on preferred A stock, also a quarterly dividend of 1¼% on preferred B stock, both dividends are payable July 1 to stock of record June 20.

San Joaquin Light & Power Co. has declared a quarterly dividend of 1½% on preferred stock, payable June 14 to stock of record May 31.

American Telephone & Telegraph Co. has declared a quarterly dividend of 2%, payable July 15 to stock of record June 20.

Colorado Power Co. has declared a quarterly dividend of 1¾% on preferred stock, payable June 16 to stock of record May 31.

The board of directors of the Montana Power Co. have declared a quarterly dividend of 1¼% on common stock, also a quarterly dividend of 1¾% on preferred stock, payable July 1 to stock of record June 14.

# For the Readjustment Period—What?

*XXXIX.*

The business situation in the United States has improved very much in the last month, and the outlook is encouraging. It is a very great gain to have dissipated the atmosphere of pessimism which was prevalent, and that has been accomplished in large degree. The idea that the bottom was about to drop out of all markets, and that a grave period of unemployment and perhaps social disorder was pending, is no longer entertained. The people, north and south, east and west, have disposed of that bogie by simply continuing to buy goods at the greatest rate ever known, evidently without apprehensions of poverty or revolution. We conclude that the great body of the American people are disposed to go along in a normal way, whatever the rest of the world may do; and, as their buying capacity is about equal to that of all the rest of the world put together, they can do fairly well all by themselves if they try.

There is some unemployment in the large cities, but the authorities are over their worry on this subject. As a rule the returning soldiers have found their old places ready for them, and the substitutes, including many thousands of women, are finding employment also.

To sum up the situation, there is a gratifying recovery of sentiment in trade circles, brought about by the sustained consumption of goods and the widespread prosperity enjoyed by the agricultural class. There is no gainsaying that the latter is the backbone of the business situation, and will be for the year to come.

—National City Bank of New York.

Further development of the electrical industry has unquestionably been slowed up by delays in new construction, plant improvement, etc., which in turn have depended upon settlement of prices, wage scales and the like; but this situation is clearing, also, to a very marked degree.

C. A. TUPPER *President*
INTERNATIONAL TRADE PRESS, INC., CHICAGO

## Earnings.

### WESTERN UNITED GAS & ELECTRIC.

For the year ended June 31—

| | 1919. | 1918. |
|---|---|---|
| Gross earnings | $1,985,442 | $1,846,890 |
| Net after taxes | 765,229 | 702,080 |
| Bond interest | 326,283 | 314,666 |
| Balance, surplus | 438,946 | 387,414 |

### PHILADELPHIA COMPANY.

For April, gross earnings increased $327,424; net earnings increased $80,240. For the four months ended April 30, gross earnings increased $1,505,395; net earning increased $1,676,968.

### GENERAL GAS & ELECTRIC CO.

| System. | April, 1919. | April, 1918. |
|---|---|---|
| Rutland | $ 42,527.54 | $ 39,517.57 |
| Northwestern Ohio. | 26,500.00 | 23,776.63 |
| Sandusky | 42,329.23 | 39,787 25 |
| Binghamton | 38,035 46 | 33,432 17 |
| Sayre | 10,392.66 | 10,023.12 |
| New Jersey | 26,754.00 | 21 476 56 |
| Interurban Gas Co. | 699.32 | 660.04 |
| Totals | $187,238.21 | $168,673.34 |

### PACIFIC GAS & ELECTRIC CO.

| | 1918. | 1917. | Increase. |
|---|---|---|---|
| Gross operating revenue | $22,595,516 | $19,813,381 | $2,782,135 |
| Deduct: | | | |
| Operating and administrative expenses | 9,740,549 | 8,904,330 | 836,219 |
| Taxes | 1,782,939 | 1,253,239 | 529,700 |
| Maintenance and reserve for depreciation | 2,870,841 | 2,457,121 | 413,720 |
| Uncollectible accounts and casualties reserves | 336,000 | 240,000 | 96,000 |
| Total deductions | $14,730,329 | $12,854,690 | $1,875,639 |
| Net earnings from operation | $ 7,865,187 | $ 6,958,691 | $ 906,496 |
| Add: Miscellaneous income | 510,201 | 508,347 | 1,854 |
| Total | $ 8,375,388 | $ 7,467,038 | $ 908,350 |
| Bond and other interest | 4,117,066 | 4,100,907 | 16,159 |
| Balance | $ 4,258,322 | $ 3,366,131 | $ 892,191 |
| Bond discount and expense | 187,019 | 185,051 | 1,968 |
| Balance | $ 4,071,303 | $ 3,181,080 | $ 890,223 |
| Additional reserve for depreciation per Railroad Commission order No. 3484 | 1,000,000 | 1,000,000 | ..... |
| Surplus | $ 3,071,303 | $ 2,181,080 | $ 890,223 |
| Dividends paid on preferred stock | 1,490,463 | 1,471,105 | 19,358 |
| Balance | $ 1,580,840 | $ 709,975 | $ 870,865 |

### ELECTRIC BOND & SHARE.

March 15, 1905, to Dec. 31, 1918.

| | Gross income. | Net income. | Preferred dividends. | Balance. | Common dividends. | Accumulated income. |
|---|---|---|---|---|---|---|
| Mar. 15, 1905, to Jan. 31, 1906 | $ 284,358.87 | $ 236,126.41 | $ 87,500.00 | $ 148,626.41 | ..... | $ 148,626.41 |
| Year ended Jan. 31, 1907 | 483,243.41 | 431,823.81 | 100,000.00 | 331,823.81 | ..... | 480,450.22 |
| Year ended Jan. 31, 1908 | 328,873.39 | 243,412.63 | 100,000.00 | 143,412.63 | ..... | 623,862.85 |
| Year ended Jan. 31, 1909 | 442,881.11 | 311,851.68 | 100,000.00 | 211,851.68 | ..... | 835,714.53 |
| Eleven months ended Dec. 31, 1909 | 737,759.32 | 593,719.72 | 91,666.67 | 502,053.05 | $ 80,000.00 | 1,257,767.58 |
| Year ended Dec. 31, 1910 | 691,404.31 | 507,418.38 | 100,000.00 | 407,418.38 | 160,000.00 | 1,505,185.96 |
| Year ended Dec. 31, 1911 | 966,257.36 | 707,211.76 | 103,333.33 | 603,878.43 | 160,000.00 | 1,949,064.39 |
| Year ended Dec. 31, 1912 | 1,566,978.86 | 1,226,657.26 | 160,932.36 | 1,065,724.90 | 225,333.33 | 2,789,455.96 |
| Year ended Dec. 31, 1913 | 1,554,403.63 | 1,129,395.65 | 277,900.41 | 851,495.24 | 1,863,000.00* | 1,777,951.20 |
| Year ended Dec. 31, 1914 | 1,558,520.65 | 1,137,041.69 | 298,391.67 | 838,650.02 | 400,000.00 | 2,216,601.22 |
| Year ended Dec. 31, 1915 | 1,820,337.11 | 1,401,084.95 | 344,646.77 | 1,056,438.18 | 433,777.78 | 2,839,261.62 |
| Year ended Dec. 31, 1916 | 2,170,915.12 | 1,566,932.44 | 375,557.52 | 1,191,374.92 | 1,458,222.22* | 2,572,414.32 |
| Year ended Dec. 31, 1917 | 3,140,020.37 | 2,066,389.81 | 487,710.49 | 1,578,679.32 | 644,888.89 | 3,506,204.75 |
| Year ended Dec. 31, 1918 | 2,599,674.02 | 1,450,081.68 | 511,773.25 | 938,308.43 | 680,545.85 | 3,763,967.33 |
| Total | $18,345,627.53 | $13,009,147.87 | $3,139,412.47 | $9,869,735.40 | $6,105,768.07* | $3,763,967.33 |
| Surplus at beginning of business, March 15, 1905 | | | | | | 440,599.40 |
| Net changes in surplus during period of company's existence through reappraisement of securities and the creation of a reserve fund | | | | | | 446,861.57 |
| Surplus and undivided profits at close of business Dec. 31, 1918 | | | | | | $4,651,428.30 |

*Includes special dividends on common stock ($1,500,000 in 1913 and $1,000,000 in 1916).

### ADIRONDACK ELECTRIC POWER CORP.

| | April, 1919. | April, 1918. |
|---|---|---|
| Gross earnings | $133,574 | $135,730 |
| Net after taxes | 54,396 | 38,933 |
| Fixed charges | 21,162 | 21,196 |
| Balance, surplus | 33,234 | 17,737 |

### PENNSYLVANIA UTILITIES SYSTEM.

| | —Month of April— 1919. | 1918. |
|---|---|---|
| Operating revenues | $140,076.03 | $126,080.54 |
| Operating expenses and taxes | 92,282.08 | 92,282.04 |
| Operating income | $ 47,793.95 | $ 33,798.50 |

Income applicable to bond interest 12 months ended April 30, 1919:

| | |
|---|---|
| Gross revenue (includes other income) | $1,695,068.39 |
| Operating expenses, taxes, rentals and miscellaneous deductions of Eastern Pennsylvania Power Co. and Easton Gas Works | 1,269,244.11 |
| Balance | $ 425,824.28 |
| Interest: | |
| On $742,000 Easton Gas Works Bonds (5%) | $37,100.00 |
| On Pennsylvania Utilities Co. First Mortgage Bonds: $3,276,000 outstanding (5%) | 163,800.00 |
| $540,000 to be issued (5%) | 27,000.00 |
| Total first mortgage interest | $ 227,900.00 |
| Balance | $ 197,924.28 |
| Interest on $1,225,000 of Pennsylvania Utilities Co. 6% second mortgage notes | $ 73,500.00 |
| | $ 124,424.28 |

Earnings are equivalent to more than 1.86 times requirements for first mortgage interest.

### WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

| Public Utilities. | Div. rate. Per cent. | Bid May 27. | Bid June 3. |
|---|---|---|---|
| Adirondack Electric Power of Glens Falls, common | 6 | 15 | 14⅜ |
| Adirondack Electric Power of Glens Falls, preferred | 6 | 75 | 75½ |
| American Gas & Electric of New York, common | 10+extra | 170 | 170 |
| American Gas & Electric of New York, preferred | 6 | 41 | 41 |
| American Light & Traction of New York, common | .. | 270 | 269 |
| American Light & Traction of New York, preferred | 6 | 99 | 99 |
| American Power & Light of New York, common | 4 | 66 | 66 |
| American Power & Light of New York, preferred | 6 | 76 | 74 |
| American Public Utilities of Grand Rapids, common | .. | .. | 10 |
| American Public Utilities of Grand Rapids, preferred | 7 | 32 | 36 |
| American Telephone & Telegraph of New York | .. | 105⅞ | 107 |
| American Water Works & Elec. of New York, common | .. | 9 | 7½ |
| American Water Works & Elec. of New York, particip | 7 | 14 | 15 |
| American Water Works & Elec. of New York, first preferred | .. | 58 | 60 |
| Appalachian Power, common | .. | 3 | 6 |
| Appalachian Power, preferred | 7 | 10 | 16 |
| Cities Service of New York, common | +extra | 378 | 378 |
| Cities Service of New York, preferred | 6 | 79½ | 79½ |
| Commonwealth Edison of Chicago | 8 | 111 | 111 |
| Comm. Power, Railway & Light of Jackson, common | .. | 26½ | 28 |
| Comm. Power, Railway & Light of Jackson, preferred | 6 | 56 | 58 |
| Federal Light & Traction of New York, common | .. | 10 | 10 |
| Federal Light & Traction of New York, preferred | .. | 46 | 46½ |
| Illinois Northern Utilities of Dixon | 6 | 70 | 70 |
| Middle West Utilities of Chicago, common | 2+extra | 35 | 35 |
| Middle West Utilities of Chicago, preferred | 6 | 60 | 60 |
| Northern States Power of Chicago, common | .. | 72½ | 72½ |
| Northern States Power of Chicago, preferred | ex div.7 | 90 | 90 |
| Pacific Gas & Electric of San Francisco, common | .. | 57½ | 57 |
| Pacific Gas & Electric of San Francisco, preferred | 6 | 88 | 88 |
| Public Service of Northern Illinois, Chicago, common | 7 | 89 | 88 |
| Public Service of Northern Illinois, Chicago, preferred | 6 | 90 | 92 |
| Republic Railway & Light of Youngstown, common | 4 | 19 | 19 |
| Republic Railway & Light of Youngstown, preferred | 6 | 59 | 59 |
| Standard Gas & Electric of Chicago, common | .. | 41 | 37 |
| Standard Gas & Electric of Chicago, preferred | 6 | 48½ | 47 |
| Tennessee Railway, Light & Power of Chattanooga, common | .. | 4½ | 4½ |
| Tennessee Railway, Light & Power of Chattanooga, preferred | 6 | 20½ | 20½ |
| United Light & Railways of Grand Rapids, common | 4 | 47 | 48 |
| United Light & Railways of Grand Rapids, preferred | 6 | 72 | 72 |
| Western Power of San Francisco, common | .. | 23 | 22½ |
| Western Union Telegraph of New York | extra | 89¼ | 90⅛ |
| Industries. | | | |
| Electric Storage of Philadelphia, common | 4 | 75 | 74½ |
| General Electric of Schenectady | 8 | 164½ | 168½ |
| Westinghouse Electric & Mfg. of Pittsburgh, common | 7 | 57⅛ | 57⅝ |
| Westinghouse Electric & Mfg. of Pittsburgh, preferred | 7 | 56½ | 57 |